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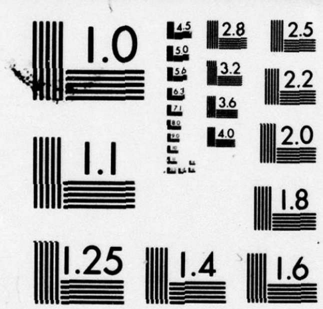

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RECREATION RESEARCH PROGRAM

RRP

MODELING RECREATION USE IN WATER-RELATED PARKS

by Robert E. Coughlin, David Berry, Pat Cohen
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LEVEL II

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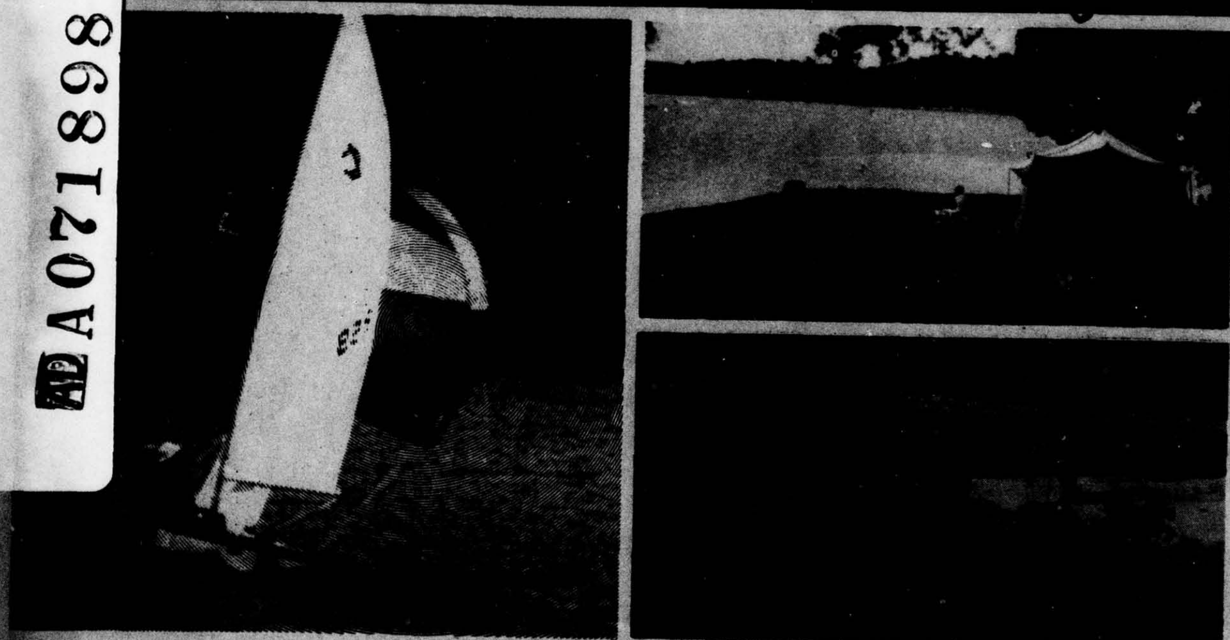

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31 October 1978

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1. The technical report transmitted herewith represents results of a research effort completed as part of the Corps of Engineers' Recreation Research Program (RRP). The objectives of the RRP are to improve the efficiency and the effectiveness with which the Corps delivers outdoor recreation services to the general public. The study reported herein addresses an analysis of the supply and demand of nonreservoir recreation projects.

2. Nonreservoir water resource development projects are becoming increasingly important elements of the Corps' civil works program. Various statutory and administrative authorities require the Corps to consider the recreation potential provided by nonreservoir projects such as channels, levees, beach erosion control, and inland and coastal navigation facilities.

3. The planning and design of nonreservoir projects is hampered by the lack of standard procedures and techniques for use prediction, benefit estimation, and the development of conceptual recreation plans. Recently completed research by the Corps' Sacramento District involved the analysis of supply and demand of urban-oriented nonreservoir recreation using data from a single geographic locale. The purpose of the study reported herein was to further test and evaluate the general model formulation developed by the Sacramento District in other geographic areas and on other types of nonreservoir projects.

4. Included in this report are the results of the development and evaluation of alternative use prediction model formulations for five different types of nonreservoir projects. Recreation visitation data collected at 30 New York State Parks were used in the analysis. Although the results were not as successful as those reported by the Sacramento District in terms of explained variation in visitation and magnitude of error, they do support previous findings as to the most useful variables for modeling recreation visitation.

5. As noted in the report, one of the limitations of the modeling effort was the small number of observations available from the New York State Park data. Even though restrained by these limitations, the results of this study do contribute to the general understanding of outdoor recreation visitation patterns and provide specific tools that can be used in nonreservoir recreation planning.

John L. Cannon
JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

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This report extends to nonreservoir parks the earlier work of the U. S. Army Corps of Engineers on the recreation use of reservoir parks. A thorough review of the literature was followed by a test of several models including those already completed by the U. S. Army Engineer District, Sacramento. For this test, data from New York State Parks were used. The results are somewhat weaker than those obtained by the Sacramento District. This is attributed, in part, to the fact that the data were collected for another purpose and did not contain as many observations as would be desirable for a spatial analysis of this type.

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PREFACE

The study reported herein was developed as part of the Recreation Research Program (RRP). The RRP is sponsored by the Office, Chief of Engineers, U. S. Army, and is managed by the Environmental Laboratory (EL) of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi.

The work was performed under Contract No. DACW39-77-C-0085 between the Regional Science Research Institute (RSRI), Philadelphia, Pennsylvania, and WES. The report was prepared in order to describe the testing and evaluation of a nonreservoir recreation use prediction model previously developed by the U. S. Army Engineer District, Sacramento.

The study was conducted by Messrs. Robert E. Coughlin, David Berry, and Pat Cohen, assisted by Ms. Janet E. McKinnon, Mr. Ernest Leonardo, and Ms. Jacqueline Harmon of the RSRI.

Data from the 1976 visitor survey of the New York Office of Parks and Recreation were provided by Mr. Robert A. Anderson, Associate Economist of the New York Office of Parks and Recreation.

This contract is part of the work being conducted under the RRP, Dr. Adolph J. Anderson, Program Manager.

The contract was managed by Mr. William J. Hansen under the supervision of Dr. Conrad J. Kirby, Chief, Environmental Resources Division, and under the general supervision of Dr. John Harrison, Chief, EL.

Director of WES during the study and preparation of this report was COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
feet	0.3048	metres
miles per hour	1.609344	kilometres per hour
miles (U. S. statute)	1.609344	kilometres

MODELING RECREATION USE IN WATER-RELATED PARKS

PART I: INTRODUCTION

1. For many years, the U. S. Army Corps of Engineers Civil Works Program has been concerned with the recreation potential of reservoir projects. As part of its project and system planning for reservoirs, the Corps has given careful attention to the prediction of recreation use of reservoirs (Brown and Hansen 1974).

2. In recent years, nonreservoir water resource development projects have become increasingly important elements of the program. The Corps has conducted one study of the prediction of recreation use at a nonreservoir site (U. S. Army Engineer District, Sacramento, 1976) and wishes to test that type of analysis on other nonreservoir sites to determine whether it has potential for application in other geographic areas and for other types of nonreservoir projects.

3. The objective of this report is to test and extend work on the prediction of recreation use already completed by the Sacramento District and provide a basis for nonreservoir park system planning by Corps of Engineers planners. In order to do this the major studies of the prediction of recreation use are reviewed and recreation use prediction models are tested on a nonreservoir park system. The empirical tests were made using data from the New York State park system.

PART II: REVIEW OF THE LITERATURE

4. Participation in outdoor recreation has, over the past dozen years or so, been studied in a number of different ways. Some analyses (e.g., Owens 1970, and Rankin and Sinden 1971) concentrate upon visitor characteristics and participation and try to find correlations between certain types of recreational activity (such as number of activity days in swimming) and socioeconomic characteristics of participants and nonparticipants or of the population in general in a specified region. Although some of these studies did find significant correlations, most were generally unsuccessful, resulting in regression models with very low levels of statistical explanation.

5. In contrast, other researchers (e.g., Shafer and Thompson 1968) concentrated not upon visitor characteristics to explain participation but upon attributes of the parks or other recreational sites. These sometimes proved to be fairly good predictors of visits to alternative park areas.

6. Clawson and others introduced a third type of variable in analyzing park attendance. Using an idea of Hotelling, Clawson 1959 incorporated distance to the park as an explanatory variable of park attendance (which he then used to calculate a quasi-demand curve for park visits). Clawson and others using this method (e.g., Smith 1971) generally used highly aggregated data on the proportion of the population visiting a particular park from a particular region. They thus tended to attain fairly high levels of statistical significance when predicting visits per person (Flegg 1976).

7. There are historically three types of variables which analysts have studied: characteristics of the potential user population, attributes of the recreational area, and distance or cost of getting from the user's residence to the park (Clawson and Knetsch 1966, p 60). Inclusion of all three types of variables is now fairly commonplace in recreation studies. This report will refer to a relationship between visits on the one hand and park attributes, origin area population characteristics, and travel cost or distances travelled on the other

hand, as a generalized gravity model. Visits to a park should increase as the population of the origin areas increases, as the attributes of the park become more desirable for many recreationists, and as distance to the park decreases. The exact specification of these relationships will be discussed in the remainder of this section, drawing upon available literature and deriving the relationship among the variables from basic principles.

The Propensity to Visit Recreational Sites

8. Most studies of recreational participation speak of the demand for recreation as analogous to the demand for a private good purchased on the market. The objective is then to estimate a schedule of demand for visits as a function of the price of those visits. Twenty years ago, Marion Clawson 1959 employed a two-stage technique which established the procedure. First, estimate the propensity to visit recreational sites as a function of travel costs (which Clawson called the demand for the whole recreation experience). Then, by assuming that travel costs could be interpreted as the "price" of a visit or an entrance fee, adjust this propensity-to-visit function to derive a spatial demand schedule (see Berry 1973 for a discussion of spatial vs. aspatial demand curves). The subject of this report is limited to the propensity to visit open space (i.e., Clawson's first step). The spatial demand for recreational visits is closely related, of course, but requires assumptions unnecessary for estimating the number of visits to a particular recreational site.

9. The propensity to visit recreational sites may be derived from two behavioral observations:

- a. For a typical individual (or household) the number of visits to any park in a specific time period (such as one year) will decrease as the cost of the visit increases, other things being equal. Thus, in a graph of visits plotted against distance a downward sloping curve should be observed as in Figure 1.

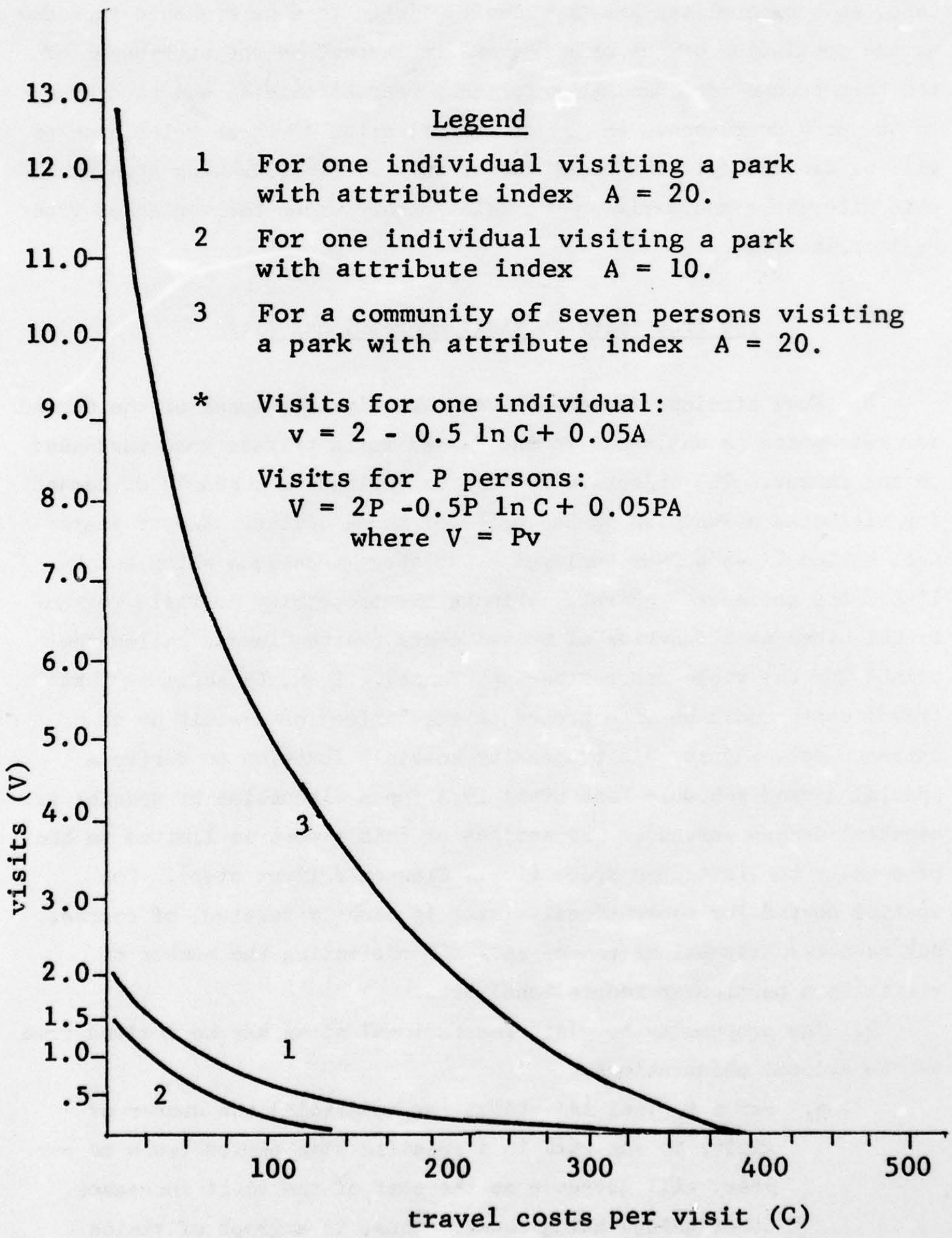

Figure 1. Propensity to visit recreation sites

b. For a typical individual (or household) the curve of visits to a park as a function of costs will shift to the right (Figure 1) as the attributes of the park become more desirable and to the left as the attributes of the park become less desirable. This kind of shift can be expressed additively if improved attributes would cause the typical individual to travel further to visit a park independently of the level of travel costs. (If this shift is dependent on travel costs, such as being greater as travel costs decrease, then the relationship is multiplicative.)

10. These two kinds of relationships are plotted in Figure 1 for an individual whose pattern of visits is described by the function:

$$v_j = a - b \ln C_j + gA_j \tag{1}$$

where v_j is visits for the individual per year to parks, j, with attributes described by A_j and travel costs described by the natural logarithm (ln) of C_j, and a, b, g are coefficients to be determined by the regression. Attributes may simply be park acreage and distance may be in miles, travel time, or travel costs. For the purpose of exposition, this report maintains this general algebraic specification, keeping in mind that in any given instance an alternative specification may be more appropriate.

11. In order to determine the behavior of all residents of the origin area i who visit parks at distance C_{ij} with attributes A_j it is necessary to scale up the typical recreationist to the community level. If the typical recreationist is the average person, it suffices merely to multiply both sides of the relationship above by P_i, the population of origin area i, to obtain total visits from area i, $P_i v_j = V_{ij}$. This is represented by curve 3 in Figure 1 (which is drawn for a community of seven persons).

12. The functional form of the relation between V_{ij} and A_j and C_{ij} is as follows:

$$V_{ij} = aP_i - bP_i \ln C_{ij} + gP_iA_j \qquad (2)$$

13. Notice that the function is made up of interaction terms of P and C and P and A . This formulation merely stretches the individual's propensity-to-visit curve upward, while holding it at the same intercept along the C axis as occurs for the individual at a given level of attribute A_j . (Thus, curves 1 and 3 have the same intercept along the C axis even though one is for an individual and the other is for the community.) This says that people in the community will not travel any farther to visit a park with certain attributes than the average person would. (For many commonly used functional forms of the propensity-to-visit curve, this is not the case.)

Refinements

14. A number of refinements have been suggested to deal with the characteristics of individuals, the characteristics of parks, and the attracting power of substitute parks.

<u>Individual versus community</u>

15. Many analysts have remarked that the average individual's behavior cannot simply be inflated to obtain the community behavior (Lavery 1975). One problem is, of course, that the average individual does not really exist. In reality there are individuals with different interests in outdoor recreation which may or may not be correlated with income level, level of educational attainment, age, stage of life cycle, recreational experiences when they were children, and the like. This would suggest two possible solutions. First, descriptive characteristics of the individuals could be included and modelled as additive terms:

$$v_j = a - b \ln C_{ij} + gA_j + \sum_k r_k x_k \qquad (3)$$

where the x_k are socioeconomic descriptors, such as, percent in a certain income category. (Of course a multiplicative or exponential formulation may also be appropriate.) For the community as a whole, the equation would be:

$$V_{ij} = aP_i - bP_i \ln C_{ij} + gP_iA_j + \sum_k r_kP_i\chi_{ik} \qquad (4)$$

which includes interaction terms between P and χ added to the original model. This approach shifts the curve depicted in Figure 1 to the left or right depending upon the signs of the coefficients r_k. Secondly, and more simply, the power of P could be adjusted on the right-hand side, raising P to the γ power, $\gamma \neq 1$, as a crude way to account for differences between the behavior of individuals and communities.

Attributes of recreational sites

16. As with recreationists, it is often desirable to recognize the multidimensionality of the attributes of recreational sites. Different park features may have different attracting power on the population. Some investigators have incorporated several distinct measures of attributes in the estimation of the number of visits to alternative parks as separate variables (e.g., Freund and Wilson 1974, and Van Lier 1973). However, others have combined attributes into a single measure such as acreage of the parks or water surface acreage (Brown and Hansen 1974, for instance) or taken on algebraic combinations of attributes to yield an index of attractiveness (e.g., Shafer and Thompson 1968, Cheung 1972, or Cesario 1976). Among the park attributes typically considered are: acreage of various features, quantity or quality of facilities such as number of campsites or length of the shoreline, vegetative cover, meteorological conditions, and so on, depending upon the types of parks one is dealing with.

Substitute parks

17. A further refinement in the model is the inclusion of a variable describing substitute parks which may reduce the number of visits to a park with attribute A_j at a distance (cost) of C_{ij}. This is especially important in estimating the effects of opening new parks or closing existing ones. Ideally, the substitute parks should be described by their distance from i and by their attributes. Several methods for describing substitute parks have been used:

a. Simply using the distance or cost of getting to the

substitute park for each substitute park separately (Burt and Brewer 1971, and Moncur 1975). Thus the right-hand side of the equation for the individual recreationist would include the terms $h_{ik}C_{ik}$ for all substitute parks, k . Park attributes are implicitly included insofar as each park is described by a separate variable and coefficient. Both Burt and Brewer and Moncur obtained positive and negative regression coefficients, h_{ik} , for the cost of getting to substitute parks indicating the presence of substitutes (positive signs) and possibly exotic attractions or misspecification errors (negative signs).

b. Using a single term describing the attributes and distances of all parks k except the park of interest, park j . This term might be $h\sum_k A_k/C_{ik}$, $k \neq j$, which would then be included on the right-hand side of the equation for the individual recreationist.

c. Including parks as substitutes only if they meet certain requirements. Brown and Hansen 1974 suggested the requirement that the parks be considered as substitutes only if they are closer to the origin area than the park in question ($C_{ik} < C_{ij}$) or if A_k/C_{ik} is greater than A_j/C_{ij} , where k is the substitute park and j is the park of interest. This latter version considers attributes as well as distance of the substitute. The substitute measure to be included on the right-hand side of the equation for the individual recreationist would then be either $h\sum_k 1/C_{ik}$ if $C_{ik} < C_{ij}$, or $h\sum_k A_k/C_{ik}$, if $(A_k/C_{ik}) > (A_j/C_{ij})$ where k is the substitute park and j is the park of interest.

Extreme Values of Number of Visits (V)

18. One of the major problems in specifying a model of visits is the disparity between the observed number of visits and predicted

number of visits at large and small values of C . Some formulations, such as those involving logarithms or hyperbolas, exhibit such problems because the curves are asymptotic to the V and C axes. One solution is to ignore those parts of the curve outside the range of observations (such as all estimates of V where C is less than the minimum observed distance travelled and all estimates of V where C is greater than the maximum observed distance travelled) by assuming V is zero. This practical solution does present difficulties when trying to ascertain the effect of improved attributes on the marginal (most distant) visitors, though. A specification like that in Figure 1 overcomes the problem along the C axis because it cuts the C axis; so also do linear and some other specifications.

19. A related problem is that of specifying a simple distance decay curve that has a negative slope until it reaches the maximum distance travelled and then takes on values of V equal to exactly zero instead of slightly positive values or negative values. As a practical matter, though, most analysts simply do not include observations beyond an estimate of the maximum distance travelled so as to avoid estimation errors caused by a series of values of zero for V as C increases.

20. A final problem is what to do if the specification calls for taking logarithms of V when $V = 0$. A typical solution is to use $V + 1$ as the measure of visits.

Estimation of the Parameters of the Model

21. With some significant exceptions (e.g., Cesario 1976), least squares or regression methods are usually employed to estimate the parameters of the model once it is specified. This means that the model must be capable of being transformed into a linear equation, through the taking of logarithms or by some other means. The model with additive interaction terms as described in Figure 1 has been used by Mansfield 1969 and Van Lier 1973 (p 48), but generally it has not

been widely adopted.* Rather, the most common approaches have been as follows:

<u>a</u>. $\ln V = \alpha_0 + \alpha_1 \ln P + \alpha_2 \ln A + \alpha_3 \ln C + err$ (5)

where err is the error term and where additional terms for substitute parks or population characteristics are sometimes included on the right-hand side. This model yields constant elasticities of V with respect to P , A , and C . Moreover, the attribute variable has a greater (multiplicative) effect on V as C decreases. For examples of this kind of model see (Thompson 1967, Freund and Wilson 1974, and Flegg 1976).

<u>b</u>. $\ln V = \alpha_0 + \alpha_1 P + \alpha_2 A + \alpha_3 C + err$ (6)

where substitute park variables and population characteristics variables may also be included. This specification yields variable elasticities of visits and an increasing effect of A on V as C decreases. See Flegg 1976 for an example of this model.

<u>c</u>. $\ln (V/P) = \alpha_0 + \alpha_1 \ln A + \alpha_2 \ln C + err$ (7)

with or without substitute park variables or population characteristic variables. This assumes that the elasticity of V with respect to P is unity and that the effect of A on V increases as C decreases. See (Gibson and Anderson 1975) or (Flegg 1976) for examples of this model.

<u>d</u>. $\ln (V/P) = \alpha_0 + \alpha_1 A + \alpha_2 C + err$ (8)

with or without park substitute variables or population characteristics. It, too, implies that the effect of A on V increases as C decreases. Gibson and Anderson 1975 employ this type of function.

<u>e</u>. Various functions with additive terms consisting of

---

* Mansfield did not use ln C , but rather e^{-C} and C^{-2} to obtain a decay function for the average visitor. Van Lier used $e^{-\beta B}$ as the distance decay function for his study of Dutch recreational sites.

multiplied or interacting variables. For example, Brown and Hansen 1974 used a function of the form

$$V = \alpha_0 + \alpha_1(PA/C) + \alpha_2(P/C) + err \qquad (9)$$

with a substitution variable also included. Cheung 1972 employed a function of the form

$$V = \alpha_0 + \alpha_1 P/C + \alpha_2 A/C + \alpha_3/C + err \qquad (10)$$

with a term for substitute parks as well in his study of recreational sites in Saskatchewan.

22. The error term in an estimate of visits is a critical and often overlooked statistic. First, the pattern of residuals from the regression equation should be examined. If positive or negative residuals are geographically clustered, there may be a misspecification of the model. If residuals are much larger for those calculations yielding large estimates of visits than for those yielding small estimates of visits, the distribution of error is said to be heteroscedastic. The possibility of such a systematic error should be kept in mind. Its existence might result in the estimate of visits being far more likely to suffer a great error for large attractive parks close to large cities. Finally, a single summary measure of error, the standard error of estimate, describes one aspect of goodness of fit. In logarithmic transformations, the error term is thus multiplicative, but it is additive in additive models. A 95 percent confidence interval in a logarithmic model might lead to a lack of confidence in the estimates where V is large but may be a better description of the error term than an additive error in a heteroscedastic distribution around a linear equation. Without knowing whether the pattern of errors is homoscedastic, it is impossible to say whether an additive or multiplicative error term is preferable.

Spatial Units of Observation

23. As a matter of actual calculation of the regression equation one has to consider what the spatial units of observation are to be, and specifically what the size of each origin area is to be. Most of

the recreational sites studied are large county, state, or national parks or recreation areas, so an areal unit as large as a county or subcounty unit is appropriate as the size of the origin area. Aggregation of origin areas into a small number (say 10) will boost the goodness of fit of the regression model but at the great expense of possibly introducing major biases into the regression coefficients (Flegg 1976). Thus, studies in which origin areas are specified as a few rings of distance or time intervals around the park in question may suffer from strongly biased coefficients.

Disaggregation of Recreational Activities

24. A final question in the formulation of a model of recreational behavior is the disaggregation of activities: swimming, fishing, boating, hiking, picnicking, and so on. It would not, in general, be expected that boaters and picnickers would have the same propensity to visit a particular park, for example. Thus, where the data permit, most analysts recommend splitting different types of recreation apart and modelling them separately. For example, Flegg 1976 found the elasticities of visits with respect to travel costs varied from -0.98 for fishermen at Llandegfedd Reservoir with seasonal permits to -1.82 for fishermen with daily permits. He also found that the elasticity of visits with respect to population size varied from 0.33 for casual visitors to 0.80 for boaters at the same reservoir. Holman and Bennett 1973 also obtained notably different coefficients for various independent variables as they examined different types of recreational activities.

General Implications from the Literature

25. Can one infer general rules of thumb for estimating outdoor recreation levels from previous studies? Or must one undertake a special recreation study for each geographical area of interest? From the literature investigated there does not appear to be a sufficient

basis for adopting general rules of thumb. This is for four reasons: variations in the regions studied, variations in the specifications of the models, variations in the parameters of the models, and rather modest levels of goodness of fit. Some of these variations are summarized in Table 1.

26. Most functional forms used to analyze the propensity to visit recreational sites have been specified as described in sections entitled "The Propensity to Visit Recreation Sites" and "Estimation of the Parameters of the Model," with some of the forms also incorporating substitution effects as described in the latter section. Although there are only a few basic families of specification, there are enough variations within each family to make comparisons across studies nearly impossible except perhaps in terms of elasticities of visits with respect to population of the origin area, with respect to the costs (distance or time) involved in travelling to the recreation site plus any admission fees, and with respect to variations in attribute characteristics. In fact, the definition of attributes varies so greatly that the authors are hesitant to report any similarities from one study to the next with respect to this variable. The elasticities of V with respect to P and C can be seen to vary widely in the cases reported in Table 1. Besides these there are also cases where the elasticity of P is assumed to be unity when the dependent variable in a log-log transformation is written as ln (V/P) . In light of these results, rules of thumb on elasticities seem tenuous. Indeed, others such as Lavery 1975 have come to the same conclusion. Finally, one should be hesitant to apply elasticities of the propensity to visit a recreation site with respect to costs that were estimated from data collected prior to the dramatic increases in fuel prices in 1973 and 1974.

27. Table 1 also shows that goodness of fit varies greatly across the studies. With a few exceptions, goodness of fit as measured by the coefficient of determination, R^2 , is only modest. Highly disaggregated data (i.e., many observations) are likely to be scattered widely around the regression plane in part because of the omission of

Table 1

Summary of Selected Studies*

Study	Region**	Type of Recreation†	Elasticities†† of Visits with Respect to: Population	Travel Costs	Goodness of Fit R^2
Brown & Hansen 1974	California (w)	g	---	---	0.93
	West S. Central US (w)	g	---	---	0.58 to 0.67
Moncur 1975	Oahu, Hawaii (w)	g	---	---	0.18 to 0.81
Burt & Brewer 1971	Missouri (w)	g	---	-0.2 to -2.7	---
Freund & Wilson 1974	Texas (w)	f	0.4 to 1.0	-0.5 to -2.0	0.33 to 0.46
Corps of Eng 1976	California (w)	g	0.6	-0.9	0.76
Cesario 1976	Pennsylvania	g	1.0	---	0.87
Thompson 1967	Ontario	c	1.1	-1.5	0.65
Cheung 1972	Saskatchewan (w)	g	---	---	0.91
Gibson & Anderson 1975	Derwent Res. UK (w)	f	---	-2.9 to -4.8	0.27 to 0.55
Flegg 1976	Llandegfedd Res. UK (w)	b, f, g	0.3 to 0.8	-1.0 to 02.2	0.40 to 0.70
Mansfield 1969	Lake District Nat Parks UK (w)	g	---	-2.3	0.99‡

* Includes only studies which incorporate gravity-type models and which use fairly disaggregated origin areas (except Mansfield).

** (w) indicates that the study included at least some water-oriented recreation.

† g = general day use, f = fishing, c = camping, b = boating.

†† Elasticities for models with constant elasticities only, except for Mansfield which takes the elasticity at the mean distance of day users.

‡ Used highly aggregated origin areas (n = 15), hence the high value of R^2.

explanatory variables relating to individual recreationists' decisions. Standard errors were generally not published.

28. In conclusion, the existing literature indicates rather weak relationships between visits to parks and park attributes, population characteristics, and distance. The application of already-developed models to a proposed park, therefore, generally can be expected to yield equally weak and varied results.

29. Analysis of the work of earlier researchers, who have studied a variety of regions, has not been successful in identifying cross-regional similarities. In fact, it appears reasonable to suppose that regional behavioral differences do exist. Therefore, it would seem that the Corps of Engineers is wise in attempting to develop separate models for different regions rather than a single general model.

30. In the following section a new set of park visitor data will be analyzed using the American River study formulation (U. S. Corps of Engineers District, Sacramento 1976) and several other formulations in addition. A variety of formulations and variables are tested in order to determine which formulations and variables give the better results, and, therefore, would be most advisable for use in evaluating new park proposals.

PART III: ANALYSIS OF DATA FROM NEW YORK STATE PARKS

Description of Data

31. In order to perform an analysis of park demand, three sets of data are necessary: information on the location of residence and length of trip of each user, information on the socioeconomic characteristics of the residents' location, and information on the characteristics of the park. By far the most difficult to obtain is the information on residence and length of trip of the park users; it can be obtained only by a direct survey. For this study such data were made available from a visitor survey carried out in 90 New York State parks in late July and late August of 1976. The data consist of 7,000 interviews, in coded form on magnetic tape.* A sample questionnaire is included as Appendix A.

32. All water-oriented parks for which more than 38 interviews were available and which received visitors from six or more counties were selected for analysis. These 30 parks were classified as large lake parks, ocean parks, pond and small lake parks, river parks, and stream parks. Their locations are shown in Figure 2.

33. The observations (dependent variables) which are to be explained statistically consist of the number of trips from a specified origin area to a specified park. Thus, for each such origin-destination pair, data must be assembled on characteristics of origin and characteristics of destination.

34. Each individual interviewed is assumed to have spent a "recreation day" at the park in question. Thus, a recreation day, which is defined as "a visit by one individual to a recreation development or

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* The survey is summarized in <u>1976 Summer Park Visitor and Camper Surveys</u>, New York Office of Parks and Recreation. Datailed data on magnetic tape were made available by Robert A. Anderson, Associate Economist of the New York Office of Parks and Recreation. The analysis reported here is only of the Visitor Survey data; the Camper Survey data were not analyzed.

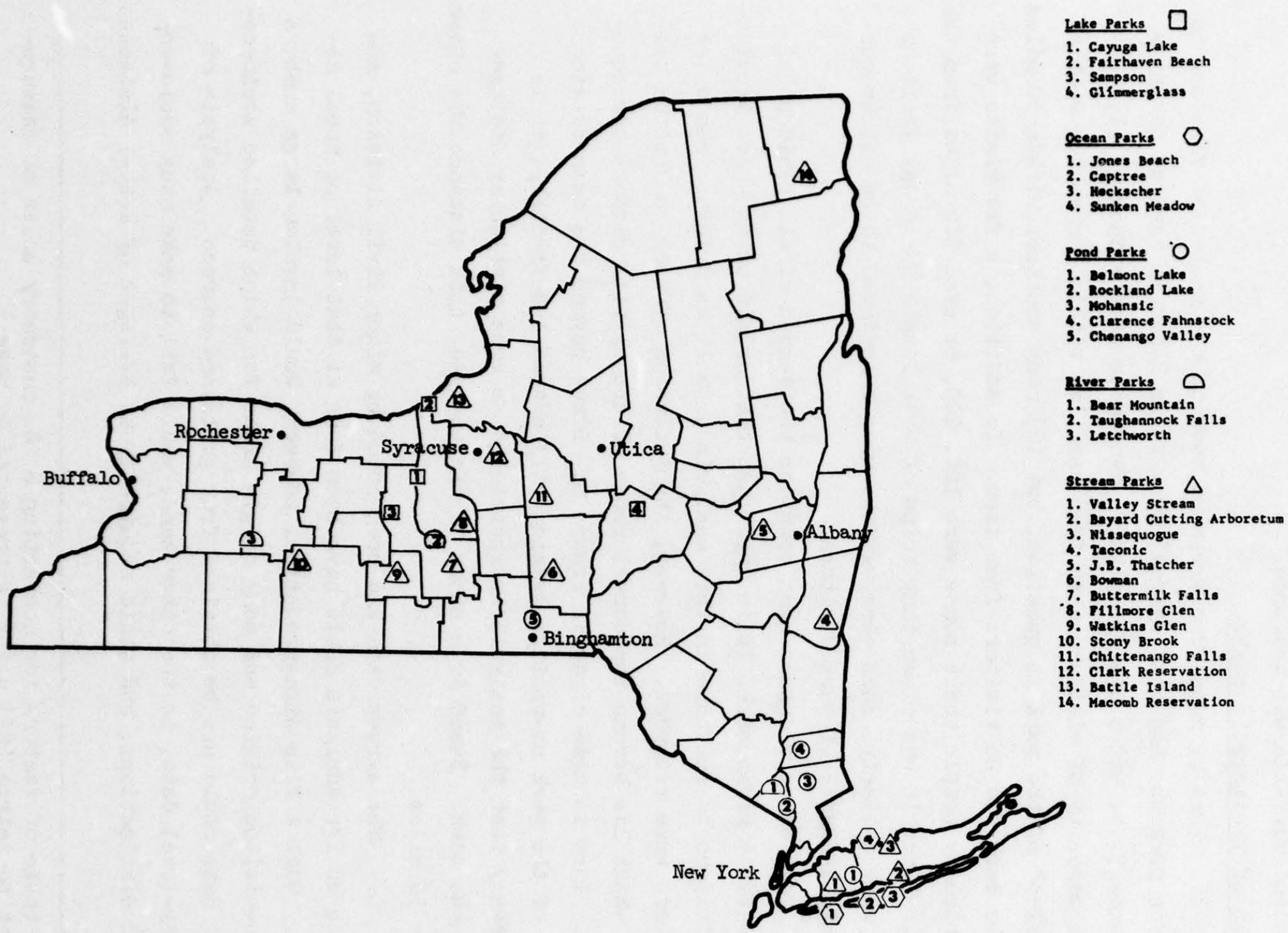

Figure 2. Location of parks analyzed

area for recreation purposes during any reasonable portion or all of a 24-hour period" (U. S. Senate, 1962), serves as the unit in which the dependent variable was measured.

Origin of visitors to parks

35. Working maps were prepared showing the number of visitors to a given park who had come "today" from their homes in various counties (Figures 3, 4, and 5 are examples). Two facts were evident: (1) the large majority of visitors came from counties within (or mostly within) 50 miles* of the park in question, but (2) many counties within 50 miles of the park had no visitors from them. In addition, a few visits were recorded by people whose homes were 100, 200, or even 300 miles from the park. Since it was clear that trips of that length for a day visit to a park were unlikely, such observations were considered to be extraneous to this analysis of park visitors.

36. Since planners must consider the demand of all residential areas for a given park, it is important that origin areas which provide no visitors be included in this analysis as well as origins from which visitors were recorded. However, the inclusion of such no-visitor origins which lie beyond the normal range of travel will distort the equation. This is made clear in Figure 6. Since beyond the main service area of the park no-visitor origins will extend indefinitely, it is necessary that the analysis be restricted to some particular distance from the park. Based on a study of mapped data, this distance was chosen to be 50 miles.

37. The survey data had been coded by minor civil division, and so the entire analysis could have been done at that level of areal detail. Such a fine disaggregation, however, would involve large numbers of no-visitor origins and many origin areas for which detailed socioeconomic data could not be obtained from published sources. Analysis of county-level data, on the other hand, would fail to make many socioeconomic distinctions, and would require gross averages of actual distances

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* A table of factors for converting U. S. customary units of measurement to metric (SI) units is presented on page 4.

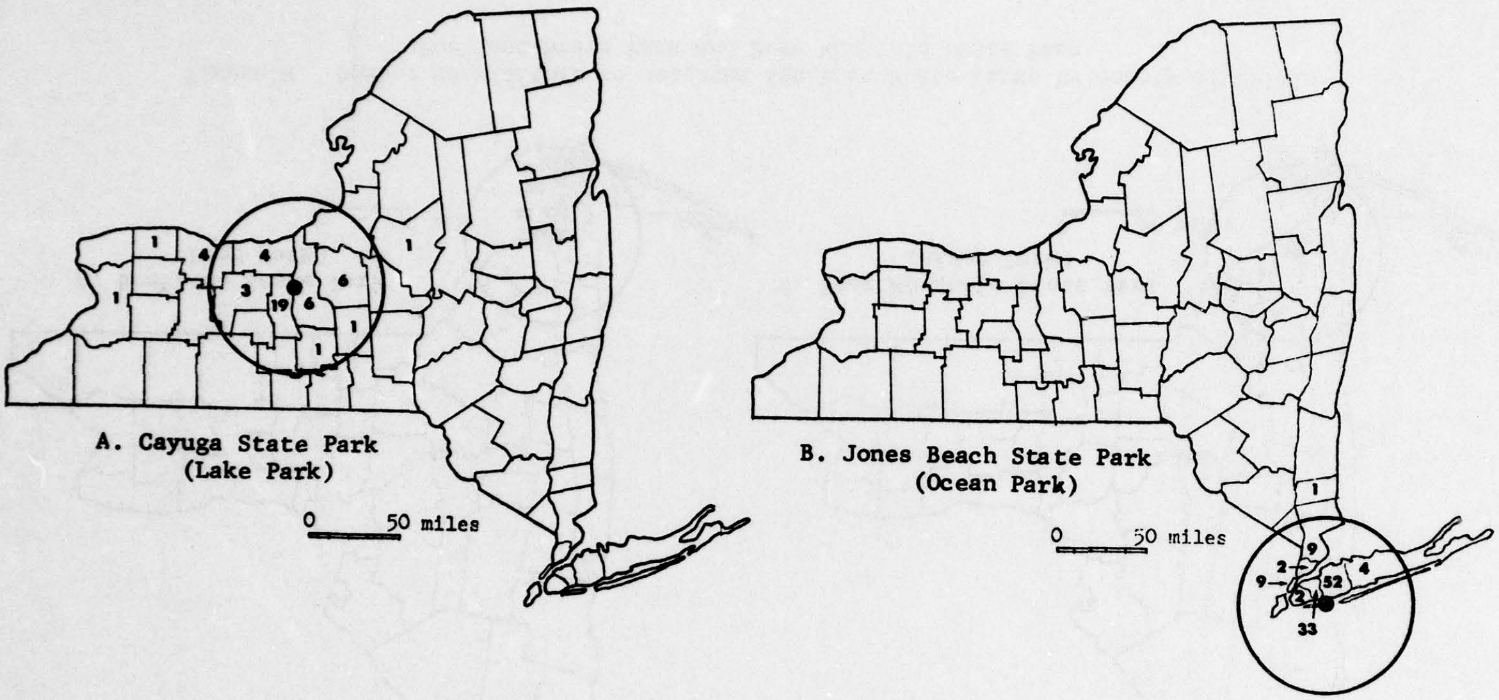

Figure 3. Number of visitors to selected New York State Parks by county of origin: Cayuga State Park and Jones Beach State Park

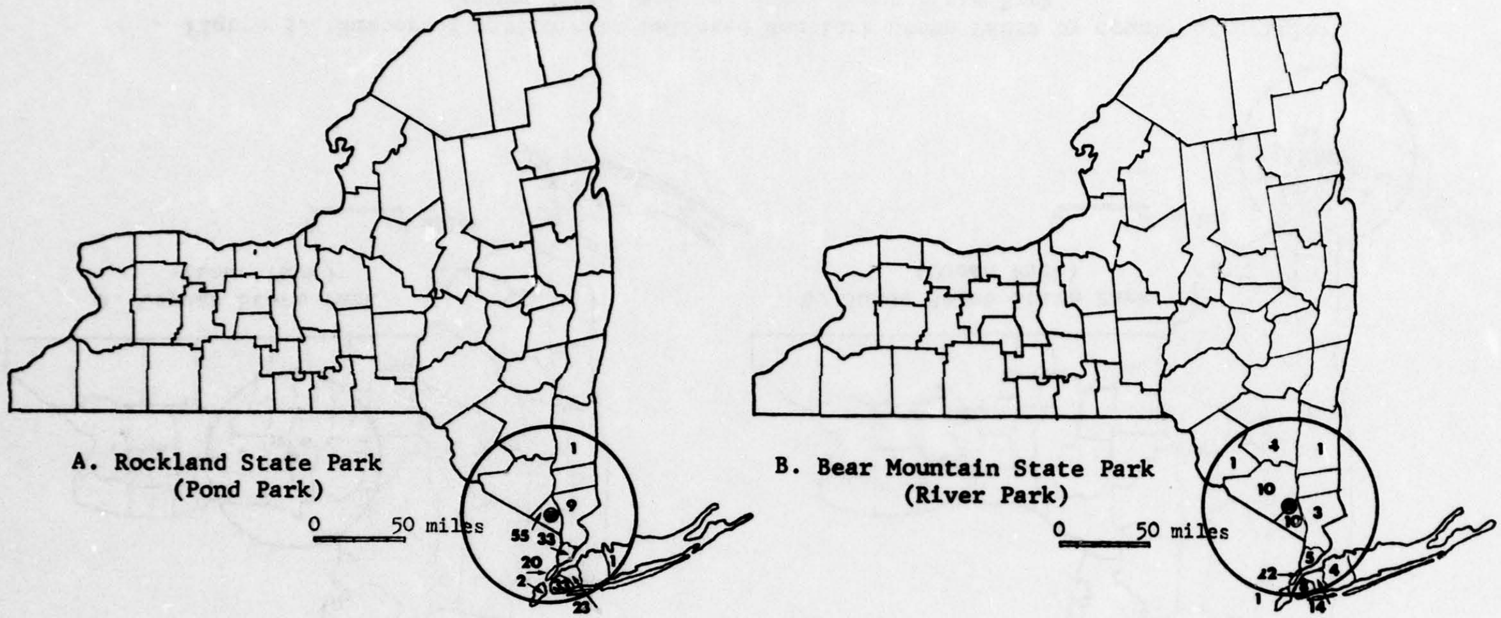

Figure 4. Number of visitors to selected New York State Parks by county of origin: Rockland State Park and Bear Mountain State Park

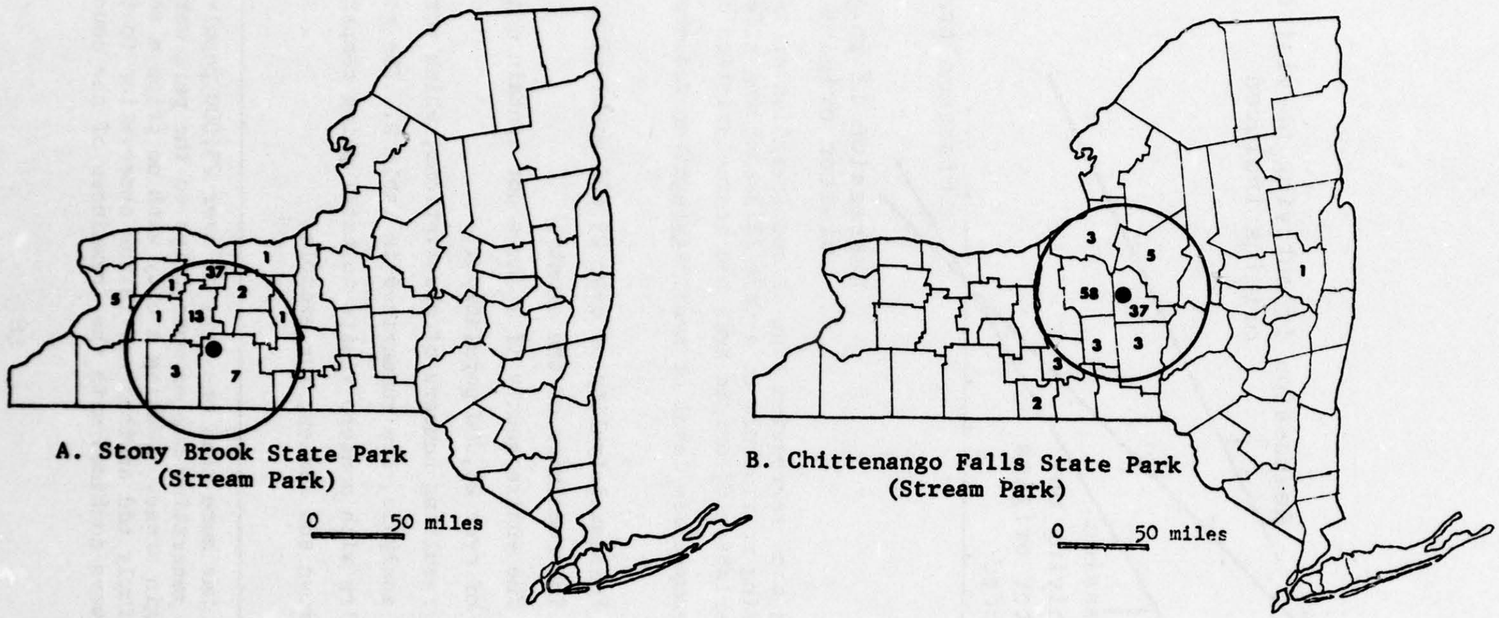

Figure 5. Number of visitors to selected New York State Parks by county of origin: Stony Brook State Park and Chittenango Falls State Park

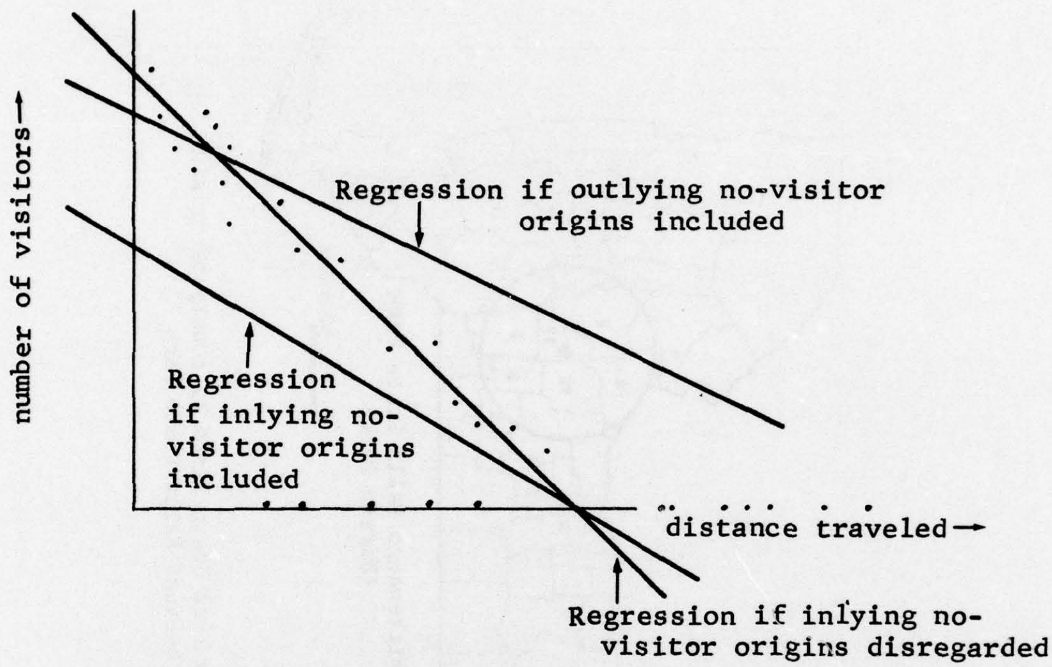

Figure 6. Effect on regression line of consideration of origin areas sending no visitors to a park (disregarding effects of characteristics of origin area and characteristics of parks)

travelled. A compromise level of areal aggregation was chosen, consisting of:

a. Each municipality of over 25,000 population.*

b. The remainder of the county.

c. The entire county if it does not contain a municipality of over 25,000 population.

38. The resulting numbers of observations, which were used for the subsequent analysis, are summarized in Table 2. The ratio of origin-destination pairs with nonzero visits to total pairs compares favorably with that of Brown and Hansen, for example.

* If a county has more than one city of over 25,000 population, only those cities generating one or more trips to the park were considered separate origin areas. (Making a city with no trips a separate origin area would simply add another no-visitor observation to the analysis. Such cities were combined with the "remainder of the county".)

Table 2

Distribution of Observations

	Total Observations	Observations with Nonzero Visits
Lake Parks		
Cayuga Lake	20	10
Fairhaven Beach	14	8
Sampson	18	13
Glimmerglass	16	12
Total	68	43
Ocean Parks		
Jones Beach	14	11
Captree	10	8
Heckscher	9	7
Sunken Meadow	10	7
Total	43	33
Pond and Small Lake Parks		
Belmont Lake	14	11
Rockland Lake	28	18
Mohansic	17	12
Clarence Fahnstock	17	15
Chenango Valley	12	8
Total	88	64
River Parks		
Bear Mountain	18	16
Letchworth	16	13
Taughannock Falls	19	10
Total	53	39
Stream Parks		
Valley Stream	15	11
Bayard Cutting Arboretum	12	11
Nissequogue	6	4
Taconic	14	11
J.B. Thatcher	14	14
Bowman	9	6
Buttermilk Falls	8	7
Fillmore Glen	6	5
Watkins Glen	14	11
Stony Brook	11	10
Chittenango Falls	14	11
Clark Reservation	6	5
Battle Island	9	7
Macomb Reservation	2	2
Total	140	115

39. The day visitor interviews had been made of every nth individual or party, where n was varied so as to limit the number of interviews in very crowded parks (such as beaches around New York City). The interview data can be analyzed directly for an individual park, but if several parks are to be analyzed simultaneously or if it is desired to predict total use, it is necessary to account for the various sampling rates and adjust the data to reflect the actual number of visitors at each park.

40. This adjustment was performed with the use of weighting factors which were supplied by the New York State Office of Parks and Recreation. The factors consist of the ratio between the annual attendance and the number of interviews completed at the park in question. Therefore, the factors are generally quite large numbers, typically 2500.

Characteristics of origin areas

41. Data on the characteristics of each origin area were assembled from the U. S. Census of Population, 1970. Since the object of the analysis is to predict how many people from a given origin area would visit a particular park, perhaps the most basic socioeconomic characteristic is the population of the origin area. Other characteristics, such as the number of people in various age groups, income and occupational levels, and the value of housing are also included as potential independent variables. The independent variables describing characteristics of origin areas are listed in Table 3.

Characteristics of the parks

42. Information on park characteristics was obtained directly from the New York State Office of Parks and Recreation. From their detailed inventory, a limited number of characteristics were selected for analysis (Table 3). These characteristics include general classification by type of park, total acreage, total water area, the existence of certain types of facilities, and the amounts of certain facilities.

43. A general description of each park, along with a map, can be found in Appendix B to this report.

44. In addition to the data on park characteristics which were used in the regression analysis, other data on activities at each park

Table 3

Description of Variables

Variable Name	
Dependent Variable	
VISIT	Number of trips (in thousands) for residence location i to park j (i.e., number of survey interviews x park weight)
Independent Variables	
Characteristics of Park j	
REGION	State Park Dept. Region in which park i is located (1, ... 12)
ACRES	Area of park in acres
W FOOT	Frontage of primary water bodies in park (00 ft)
T WATER	Frontage of all water bodies in park (00 ft)
AC L&P	Area of lakes and ponds (acres)
# TABLE	Number of picnic tables
# CABIN	Number of cabins
M TRAIL	Miles of trails
CAMP YN	Camping facilities (1, 0)
BOAT YN	Boating (1, 0)
FISH YN	Fishing (1, 0)
W SPORT	Winter sports (1, 0)
STREAM	Stream park (1, 0)
RIVER	River park (1, 0)
LAKE	Large lake park (1, 0)
OCEAN	Ocean park (1, 0)
POND	Small lake or pond park (1, 0)
Characteristics of Origin Area i	
TOT POP	Total population (thousands)
WHITE	White population (thousands)
% UND5	Percent of population under 5 yrs. of age
% 65+	Percent of population over 65 yrs. of age
INCOME	Median family income
# HOUSE	Number of housing units
# OWNOCC	Number of owner-occupied housing units (thousands)
% OWNOCC	Percent of all housing units owner occupied
VALUE	Median value of owner-occupied housing units
RENT	Median gross rent of renter-occupied housing units
Characteristics of Trip to Park	
HOURS	Estimated time of travel between origin area i and park j
Characteristics of Competing Parks	
C ACRES	Σ ln ACRES/HOURS See text paragraph 47
C WATER	Σ ln T WATER/HOURS See text paragraph 47

are available from the visitor survey. The survey asked three questions:

What are the kinds of things you usually do here?

Of these, which are most important to your coming here?

In general, what was the principal reason for your recreation trip today?

The answers to these open-ended questions are summarized for each park in Appendix C.

Characteristics of trip to park

45. The over-the-road distance from each origin area to each corresponding destination park was measured in two components: the number of miles on interstate highways and the number of miles on noninterstate highways. In order to obtain one number which describes distance from origin to park, the distance measurements were transformed into hours of travel, assuming that average speed is 55 miles per hour on an interstate highway and 35 miles per hour on a noninterstate highway. The resulting total time is the variable HOURS.

Competition by other parks

46. Other parks in the vicinity of a residence location may attract trips which otherwise would have gone to one of the destination parks in the analysis. Therefore, an additional type of independent variable was included to recognize this competitive effect. All state parks within 50 miles of each residential origin area were identified. These included many more than the 30 destination parks in thi study. The acreage of each "competing" park and the frontage of lakes and ponds within it was taken from the State park department inventory or measured on the map, and its distance from the residential origin area was measured.

47. The competing-parks variable was formulated as in an earlier study by Brown and Hansen and computed for all parks within 50 miles:

$$\text{C ACRES} = \sum_k \frac{\ln \text{ACRES}_k}{\text{HOURS}_{ik}} \text{ for all parks for which} \qquad (11)$$

$$\frac{\ln \text{ACRES}_k}{\text{HOURS}_{ik}} > \frac{\ln \text{ACRES}_j}{\text{HOURS}_{ij}} .$$

Using the data on frontage of water bodies within each park, an alternative variable was formulated:

$$\text{C WATER}_{ij} = \sum_k \frac{\ln \text{T WATER}_k}{\text{HOURS}_{ik}} \text{ for all parks for which}$$

$$\frac{\ln \text{T WATER}_k}{\text{HOURS}_{ik}} > \frac{\ln \text{T WATER}_j}{\text{HOURS}_{ij}} \tag{12}$$

Analysis

48. Two major stages of analysis were undertaken. The first stage was concerned with a set of traditional formulations and the second stage was concerned with the basic formulation of the American River Study (U. S. Army Engineer District, Sacramento 1976). In the first stage the data (see Table 4 for means and standard deviations) were analyzed separately for each park type, first by specifying a limited number of basic independent variables, and then by attempting to increase the significance of the equations by choosing variables out of the complete set of variables discussed above.

Analysis: Traditional Formulations

49. For each of the two specifications of independent variables in the first stage, a variety of statistical formulations were tested. These are as follows:

Model 1:

$$\text{VISITS} = a_o + a_1X_1 + a_2X_2 + \ldots + a_n \text{ HOURS} + \text{err} \tag{13}$$

Model 2:

$$\text{VISITS} = a_o + a_1X_1 + a_2X_2 + \ldots + a_n 1/\text{HOURS} + \text{err} \tag{14}$$

Table 4

Means and Standard Deviations of Variables*

	Lake Parks		Ocean Parks		Pond Parks		River Parks		Stream Parks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
# VISIT	5.47	9.51	102.12	138.08	21.676	39.85	35.63	54.82	10.23	21.03
REGION	4.24	0.43	9.00	0	7.36	1.18	5.06	2.17.	6.54	2.47
ACRES	863.40	644.20	1496	800	1962.80	2152.40	2559.30	1886.20	983.40	1289.40
W FOOT	94.97	62.25	181.20	97.80	166.14	96.89	236.60	308.50	14.72	39.56
AC L&P	600.00	0	900.00	0	251.40	190.70	5.28	3.53	12.79	17.34
T WATER	121.44	72.24	204.49	97.80	197.50	150.01	236.62	308.50	79.63	41.70
# TABLE	414.70	210.70	537.79	595.16	870.11	429.23	782.18	624.72	459.74	525.50
# CABIN	10.50	12.00	0	0	3.27	8.28	1.00	0	1.72	3.83
M TRAIL	8.56	4.70	4.74	4.12	17.56	19.09	14.47	18.40	8.41	8.47
CAMP YN	1.00	0	0	0	0.33	0.47	1.00	0	0.62	0.48
BOAT YN	0.77	0.43	0.44	0.50	1.00	0	0.69	0.46	0.16	0.37
FISH YN	1.00	0	1.00	0	1.00	0	1.00	0	0.71	0.46
W SPORT	0.77	0.43	0.23	0.43	0.81	0.40	0.36	0.48	0.66	0.47
TOT POP	98.51	101.93	876.96	853.92	674.69	793.62	282.94	536.85	327.53	581.92
WHITE	93.18	96.76	703.12	654.31	555.34	622.50	238.96	423.16	277.73	462.06
% UND5	8.51	0.89	8 00	1.28	8.21	1.19	8.42	1.02	8.35	1.13
% 65+	11.35	2.36	10.43	2.27	10.85	2.67	11.03	2.35	10.96	2.56
INCOME	9,757	1290	11,810	2545	11,223	2076	10,279	1843	10,493	1976
# HOUSE	30,049	31,052	299,128	305,014	225,811	279,606	93,692	188,343	107,992	203,029
% OWNOCC	70.23	11.97	51.00	26.82	55.45	23.75	65.25	17.98	63.60	19.02
VALUE	15,542	3420	31,554	10.89	27,279	11.35	19,289	8741	20,582	8970
RENT	104.50	16.76	144.02	27.59	130.76	25.57	111.17	22.42	117.51	26.59
HOURS	1.13	0.45	0.67	0.34	0.80	0.40	1.05	0.45	0.86	0.57
C ACRES	103.55	64.03	252.49	142.71	214.39	128.57	151.90	114.49	114.59	122.28
C WATER	143.81	100.23	274.55	159.24	234.73	152.64	212.46	150.77	173.69	139.96

* For units, see Table 3.

Model 3:

$$\ln \text{VISITS} = a_o + a_1X_1 + a_2X_2 + \ldots$$
$$+ a_n\text{HOURS} + err \qquad (15)$$

Model 4:

$$\text{VISITS} = a_o + a_1 \ln X_1 + a_2 \ln X_2 + \ldots$$
$$a_n \ln \text{HOURS} + err \qquad (16)$$

Model 5:

$$\ln \text{VISITS} = a_o + a_1 \ln X_1 + a_2 \ln X_2 + \ldots$$
$$a_n \ln \text{HOURS} + err \qquad (17)$$

50. The last model (equation 15) is the general form model typically hypothesized, which may be more familiar in its exponential form:

$$\text{VISITS} = e^{a_o} X_1^{a_1} X_2^{a_2} \ldots X_n^{a_n} e^{err} \qquad (18)$$

51. A comparable set of models was tested using VISITS/TOT POP as the dependent variable.

52. In order to avoid the problem of taking logarithms of variables with the value zero, all dichotomous variables which have the value 0 (i.e. no) have been assigned a value 1, and those which have the value 1 (i.e. yes) have been assigned the value e . Thus when natural logarithms are taken the results are 0 and 1, respectively. The value of 1 was added to all values of the dependent variable VISITS .

Analysis using basic independent variables only

53. One independent variable was chosen from each of the categories described in Part III under "Description of Data" and entered into the regressions. These variables were:

ACRES The size of the park in acres

TOT POP Total population of origin zone in thousands

HOURS Time of travel from origin to park

C ACRES Index of competitive parks

54. The regression results are given in Table 5. The constants and coefficients of the independent variables are arranged in a column in this table, with the standard error of estimate, the value of the coefficient of determination R^2, and the number of observations listed at the end of each column.

55. In general, TOT POP and HOURS (or 1/HOURS) proved to be highly significant variables and nearly always appeared with the expected sign. The performance of ACRES was much less impressive. For the first three park types its significance was weak to only moderate and it usually appeared with a negative sign (indicating the larger the park, the fewer visitors). The variable C ACRES also was generally of moderate significance and usually appeared with the expected sign except for the River Park equations.

56. The overall significance of the equations varied but was comparable to those of previous studies, though lower than the best of these. Goodness of fit (measured by R^2) was about the same for Models 1 and 2 (i.e., linear equations with HOURS and 1/HOURS, respectively, as independent variables). It was generally higher for the other models, which involved logarithmic terms. Generally, Models 3 and 5 (log of the dependent variable and log-log, respectively) provided the highest R^2, with Model 4 (semilog) indicating slightly less overall goodness of fit.

57. In general, the equations for River Parks were the most satisfactory; they had the highest R^2's and ACRES appeared with the appropriate sign. The ocean parks equations were least satisfactory. Their R^2's were low, ACRES appeared with the inappropriate sign, and in addition, HOURS was strongly intercorrelated with C ACRES (0.576), ln HOURS with ln C ACRES (0.510), and ln HOURS with ln TOT POP (0.552). Part of the difficulty with these parks may be their location. The variation in the origin areas and distance to the parks from New York City and Long Island may be so small as to yield nonsensical regression

Table 5

Regression Results for Specified Basic Independent Variables

	Model 1		Model 2		Model 3		Model 4		Model 5	
Large Lake Parks										
Constant	15.024		-3.345		2.071		8.848		1.695	
ACRES	-0.0013	(0.79)	-0.0012	(0.73)	0.0001	(0.70)			0.0421	(0.33)
TOT POP	0.0200	(1.87)	0.0230	(2.19)	0.0037	(3.32)	1.9676	(1.67)	0.3922	(3.14)
HOURS	-8.5685	(3.46)			-1.3631	(5.30)	-23.2491	(4.03)	-3.2841	(5.35)
1/HOURS			7.1273	(3.82)						
C ACRES	-0.0071	(0.40)			-0.0028	(1.48)	1.2470	(1.05)	-0.0135	(0.10)
S.E.		8.7068		8.6252		0.9051		8.4916		0.8982
R^2		0.2117		0.2141		0.4169		0.2383		0.4258
n		68		68		68		68		68
Ocean Parks										
Constant	287.117		332.313		4.865		519.557		6.889	
ACRES	-0.0525	(2.09)	-0.0492	(2.03)	-0.0004	(0.99)	-51.9472	(2.17)	-0.4371	(1.10)
TOT POP	0.0336	(1.20)	0.0114	(0.44)	0.0007	(1.96)	38.3254	(2.67)	0.4598	(1.93)
HOURS	-45.6179	(0.53)					-252.1978	(1.73)	-2.0937	(0.87)
1/HOURS			-8.1522	(1.01)						
C ACRES	-0.4111	(2.17)	-0.5728	(3.47)	-0.0059	(2.80)	-28.9642	(1.65)	0.3985	(1.37)
S.E.		118.9718		117.8466		1.8051		116.6850		1.9343
R^2		0.3283		0.3409		0.3001		0.3539		0.2169
n		43		43		43		43		43
Small Lakes and Pond Parks										
Constant	55.490		15.219		3.487		76.581		2.558	
ACRES	-0.0023	(1.36)	-0.0028	(0.04)			-5.5008	(1.29)	0.0193	(0.14)
TOT POP	0.0176	(3.85)	0.0191	(4.11)	0.0011	(7.78)	10.9049	(4.79)	0.5760	(7.95)
HOURS	-34.2660	(3.50)			-2.0559	(7.03)	-64.2780	(3.69)	-3.8467	(6.93)
1/HOURS			7.9038	(3.41)						
C ACRES	-0.0640	(2.15)	-0.0717	(2.45)	-0.0034	(3.74)	-7.8308	(2.21)	-0.3699	(3.27)
S.E.		33.4165		33.5203		1.0157		32.4553		1.0294
R^2		0.3292		0.3250		0.6181		0.3722		0.6124
n		88		88		88		88		88
River Parks										
Constant	49.285		23.232		3.155		-111.731		-3.662	
ACRES	0.0392	(1.30)	0.0033	(1.18)	0.0003	(3.45)	9.5630	(1.20)	0.7122	(3.12)
TOT POP	0.0665	(5.97)	0.0711	(6.73)	0.0014	(3.99)	22.6393	(4.89)	0.5958	(4.48)
HOURS	-39.4885	(3.17)			-1.9825	(5.13)	-87.000	(3.42)	-3.8210	(5.23)
1/HOURS			25.195	(4.10)						
C ACRES	-0.0067	(0.14)	-0.0093	(0.19)	0.0017	(1.05)	6.7079	(1.02)	0.1579	(0.84)
S.E.		39.4905		37.3762		1.2259		41.2861		1.1869
R^2		0.5211		0.5710		0.5304		0.4765		0.5601
n		53		53		53		53		53
Stream Parks										
Constant	23.645		12.512		2.439		9.857		1.325	
ACRES	0.0029	(2.04)	0.0018	(1.32)	0.0002	(2.24)	4.0667	(5.96)	0.2719	(2.79)
TOT POP	0.0008	(.28)	0.0006	(0.20)	0.0002	(1.14)	1.3964	(1.45)	0.1051	(1.55)
HOURS	-10.8168	(3.24)			-0.6563	(3.45)	-16.1758	(5.83)	-1.2131	(3.10)
1/HOURS			1.5726	(2.61)						
C ACRES	-0.0501	(3.49)	-0.0534	(3.71)	-0.0041	(5.02)	-5.2681	(27.57)	-0.3071	(5.24)
S.E.		19.4007		19.6476		1.1027		17.8350		1.0421
R^2		0.1734		0.1523		0.2527		0.3015		0.3326
n		140		140		140		140		140

Note: The numbers in parentheses are t-statistics.
Underlined coefficients are significant at the 0.05 level.

coefficients. The ocean parks equations, therefore, should be disregarded.

58. The dependent variable visits-per-capita was tested using independent variables as formulated in Model 1. The performance of the variables was comparable to that in Model 1 with VISITS as the dependent variable. That is, HOURS was strong and of the expected sign; C ACRES was only moderately strong, but had the appropriate sign, and ACRES was weak and frequently with the inappropriate sign. The overall goodness of fit of the VISITS-per-capita equations tended to be slightly less than those of the VISITS equations, when measured by R^2 .

59. An additional model was tested:

$$\begin{aligned} \text{VISITS} = a_1 \text{ TOT POP} &+ a_2(\text{TOT POP} \times \text{ACRES}) \\ &+ a_3(\text{TOT POP} \times \ln \text{HOURS}) \end{aligned} \tag{19}$$

As was described in Part II, this formulation is a most logical way to link individual and group behavior. Total population, however, occurs in each term and, with the data for New York State, the three composite variables were found to be very highly intercorrelated, and the coefficients of TOT POP were generally negative. The resulting regressions must be considered invalid and are not presented in this report.

Analysis using both basic independent variables and additional variables

60. Using a stepwise regression procedure, each of the independent variables listed in Table 3, including the basic independent variables, was allowed to enter the regression equations. Preliminary results were edited to remove variables which were strongly correlated with other variables (where $r > 0.5$), and the analysis was repeated. The final results are given in Table 6.

61. As with the restricted number of variables, the log-log and log-of-the-dependent variable formulations (Models 3 and 5) generally provided the highest R^2 value, with the semilog formulation (Model 4)

Table 6

Regression Results: All Variables

	Model 1		Model 2		Model 3		Model 4		Model 5	
					Large Lake Parks					
Constant	11.4217		-11.9171		2.5777		2.3901		-1.0758	
#CABIN	0.2203	(2.61)	0.3546	(3.10)						
#TABLE							6.4279	(3.01)	0.5221	(2.53)
M TRAIL			0.4263	(1.43)	0.0036	(3.27)				
REGION							-18.6354	(1.60)		
TOT POP	0.0143	(1.41)	0.0194	(1.93)			1.7369	(1.52)	0.3939	(3.38)
C WATER			0.4263	(1.43)	-0.0018	(1.56)				
HOURS	-8.5881	(3.82)			-1.3594	(5.33)	-20.8985	(4.32)	-3.4296	(6.74)
1/HOURS			7.6247	(4.31)						
S.E.		8.2579		8.0770		0.8983		8.0607		0.8505
R^2		0.2571		0.3216		0.4165		0.3243		0.4770
n		68		68		68		68		68
					Ocean Parks					
Constant	338.5060		375.4750		7.6055				4.1845	
ACRES	-0.0591	(2.58)	-0.0554	(2.44)						
AC L&P							6,103,316	(2.34)		
C WATER	-0.5389	(4.67)	-0.6076	(4.98)	-0.0054	(3.05)	-27.7288	(1.69)	-0.4986	(2.35)
TOT POP							40.8510	(2.76)	0.3080	(1.77)
INCOME					-0.0002	(2.09)				
HOURS							-253.6013	(1.74)		
1/HOURS			-9.8175	(1.53)						
S.E.		112.6400		110.8060		1.7778		114.3848		1.9175
R^2		0.3662		0.4020		0.3037		0.3791		0.1899
n		43		43		43		43		43
					Pond and Small Lake Parks					
Constant	34.2119		13.3798		3.3580		50.2055		-1.2760	
REGION									-1.9582	(2.37)
W SPORT							12.9213	(1.46)		
C WATER	-0.0680	(2.51)	-0.0735	(2.82)	-0.0032	(3.88)				
C ACRES							-6.2741	(1.75)	-0.2723	(2.66)
TOT POP	0.0220	(4.05)	0.0183	(3.94)	0.0010	(7.58)	11.3950	(4.97)	0.4746	(5.86)
% OCC	0.2998	(1.64)							-0.8417	(3.33)
% UND5							33.6090	(1.41)	1.4114	(1.67)
RENT									1.6882	(2.12)
HOURS	-35.0330	(3.35)			-1.8349	(5.84)	-71.2830	(4.11)	-3.8190	(6.26)
1/HOURS			7.1832	(2.96)						
S.E.		33.1100		33.5800		1.0100		32.1600		0.9716
R^2		0.3414		0.3143		0.6220		0.3861		0.6672
n		88		88		88		88		88
					River Parks					
Constant	140.8110		68.3899		4.2746		770.5760		2.1438	
ACRES							10.6249	(1.54)	0.7133	(3.35)
W FOOT	0.0314	(1.67)	0.0283	(1.64)						
AC L&P					-0.0975	(1.79)				
M TRAIL					0.0261	(2.47)				
TOT POP	0.0642	(6.29)	0.0683	(7.02)	0.0014	(4.09)	25.5556	(6.25)		
% UND5	-10.7232	(1.96)	-10.6716	(2.07)			-132.0969	(3.27)	-2.5481	(2.05)
INCOME							-65.3897	(1.98)		
HOURS	-38.4886	(3.08)			-1.8970	(4.57)	-70.2570	(3.08)	-3.4412	(4.89)
1/HOURS			24.7411	(4.10)						
S.E.		38.0417		35.8260		1.2127		37.1412		1.1457
R^2		0.5556		0.6058		0.5404		0.5852		0.5898
n		53		53		53		53		53

(continued)

Table 6-- concluded

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Stream Parks									
Constant	23.3619		14.3510		2.1137		18.2815		1.3233	
ACRES							$\underline{4.0726}$	(2.45)	$\underline{0.2720}$	(2.79)
W FOOT					$\underline{-0.0056}$	(2.41)				
AC L&P					$\underline{0.0116}$	(2.21)				
CAMP YN	-6.4629	(1.73)	$\underline{-7.7815}$	(2.15)			-5.2782	(1.55)		
M TRAIL	$\underline{0.0734}$	(3.57)	$\underline{0.6513}$	(3.35)	$\underline{0.0518}$	(4.50)				
C ACRES	$\underline{-0.0491}$	(3.35)	$\underline{-0.0554}$	(3.94)	$\underline{-0.0036}$	(4.72)	$\underline{-5.5408}$	(5.42)	$\underline{-0.3067}$	(5.23)
TOT POP					0.0002	(1.83)			0.1053	(1.55)
HOURS	$\underline{-9.1866}$	(2.68)			$\underline{-0.7644}$	(4.33)	-11.6690	(1.64)	$\underline{-1.2148}$	(3.10)
1/HOURS			$\underline{1.4646}$	(2.37)						
S.E.		18.5110		18.7530		1.0423		17.7740		1.0420
R^2		0.2361		0.2277		0.3422		0.3062		0.3323
n		140		140		140		140		140

Note: Numbers in parentheses are t-statistics.
Underlined coefficients are significant at the 0.05 level.

indicating slightly less overall goodness of fit. For river parks, however, Model 2 (the linear equation with the inverse of HOURS) was strongest overall.

62. Once again, the ocean park equations were less than satisfactory. A measure of length of trip entered only in Model 2 and Model 4, size of park, was usually negative, and measures of population characteristics generally failed to appear.

63. The basic independent variables fared reasonably well in competition with other possible independent variables. The time-of-travel variable (HOURS or 1/HOURS) always appears (except for ocean parks) with the appropriate sign and usually with a t-statistic value of well over 2.0. In fact, it is usually the strongest or second strongest variable in each equation. TOT POP appeared consistently for all but stream parks and ocean parks. The third basic variable, C ACRES, appeared consistently for stream parks and in Models 4 and 5 for pond parks. But as a measure of competitive or substitute parks, C WATER gave better regression results for lake parks and in Models 1-3 for pond parks, perhaps indicating that users of these types of parks are alert to the recreational opportunities afforded by the availability of water bodies.

64. ACRES, the final basic independent variable, proved to be generally weak and was often replaced by other variables describing park characteristics.

65. In most cases, when variables other than the basic variables entered, they did so with the expected sign. A number of them, however, are not significant even at the 0.05 level (as measured by t-statistics).

Effect on equations
<u>of adding variables</u>

66. Generally when an independent variable is added to an equation, the overall explanatory power of the equation is raised. And so long as multicolinearity is not introduced, the new variable will not appreciably weaken the explanatory power of the original variables. Addition of new variables, however, requires substantial amounts of time in data collection and in statistical analysis.

67. The basic independent variables used in most earlier studies

correspond with our first three basic independent variables; that is, size of park, population of origin area, and time of travel. Following the lead of Brown and Hansen, a variable was added which measures the availability of alternative parks (C ACRES). Inclusion of C ACRES resulted in an increase in R^2 in almost all cases. The increases vary widely from model to model and park type to park type. The median absolute increase is 0.0388 and the median percent increase is 11.49 percent (Table 7).

68. Conceptually, it is most important to consider the availability of existing parks when evaluating additional parks. Data collection and computation to provide the alternative parks variable, however, is immense. Time-distances must be measured from each residential origin zone to all parks within an agreed on radius--not just to destination parks. The acreage of all these parks must also be measured, and the appropriate index must be computed for each origin-destination pair. Therefore, although the inclusion of C ACRES definitely improves the equations and is most desirable from a conceptual perspective, its inclusion must be weighed against substantial staff costs.

69. The inclusion of other independent variables in addition to or instead of the four basic variables also leads to improvement in R^2, as can be seen in Table 8. Once again the increases vary widely. The median absolute increase is 0.0348, and the median percent increase is 6.09 percent--increases just slightly less than those resulting from adding the park competition variables.

70. In contrast to the park competition variable, data gathering for the other additional independent variables is relatively uncomplicated. Variables describing characteristics of the population may be compiled directly from Census publications as long as origin zones correspond to areas for which the Census provides data. Data on park characteristics, however, must be obtained by direct survey or knowledge of each park. The major difficulty, however, is that, at least based on the New York State park analysis, no one or two of these additional variables come into the equations consistently. Therefore, it is necessary to prepare data on many more variables than will eventually appear in

Table 7

Increase in R^2 Resulting from Including C ACRES as One of the Basic Independent Variables

	Model 1	Model 2	Model 3	Model 4	Model 5
Lake Parks					
absolute	0.0020	0	0.0203	0.0132	0.0002
percent	0.95	0	5.12	5.86	0.05
Ocean Parks					
absolute	0.0829	0.2083	0.0796	0.0465	0.0388
percent	33.78	157.10	36.10	15.13	21.79
Pond Parks					
absolute	0.0373	0.0488	0.0637	0.0368	0.0500
percent	12.79	17.67	11.49	10.97	8.89
River Parks					
absolute	0.0002	0.0003	0.0108	0.0113	0.0064
percent	0.04	0.05	2.08	2.42	1.16
Stream Parks					
absolute	0.0746	0.0864	0.1359	0.1427	0.1357
percent	75.51	131.11	123.23	89.86	68.92

Table 8

Effect on R^2 of Including Other than Basic Independent Variables

	Model 1	Model 2	Model 3	Model 4	Model 5
Lake Parks					
absolute	0.0454	0.1075	0	0.0860	0.0512
percent	21.45	50.21	0	36.09	12.02
Ocean Parks					
absolute	0.0379	0.0611	0.0036	0.0252	-0.0280
percent	11.54	17.92	1.20	7.12	-12.91
Pond Parks					
absolute	0.0142	-0.0107	0.0039	0.0139	0.0548
percent	4.31	-3.29	0.63	3.73	8.95
River Parks					
absolute	0.0345	0.0348	0.0100	0.1087	0.0297
percent	6.62	6.09	1.89	22.81	5.30
Stream Parks					
absolute	0.0627	0.0754	0.0895	0.0047	0
percent	36.16	49.51	35.42	1.56	0

the equation. In addition, even with a stepwise regression program, considerable judgement, trial, and retrial is required to obtain a consistent set of variables.

Evaluation and inter-
pretation of the models

71. Several overall observations may be made about the results of the regression analyses. These concern:

a. The magnitudes of the regression coefficients and what they tell us about recreational behavior.

b. The possible differences in these regression coefficients in upstate and downstate New York reflecting the influence of the much greater population density of metropolitan New York.

c. The usefulness of the models in predicting the utilization of planned water-oriented parks.

72. The regression equations have already been examined in terms of the sign and statistical significance of the coefficients. What do the magnitudes of the coefficients tell us about recreational behavior in those models with at least a modest level of goodness of fit? The simplest models to interpret are those with linear specifications and log-log specifications (Models 1, 2, and 5). We shall use the coefficients reported in Table 5 to examine the magnitudes of the effects of the independent variables on visits to the various parks.

73. The linear equation for river parks has a moderately high value of R^2 (0.52) so it is a meaningful example. For every additional hour of travel the number of visitors to a river park drops off by 39,000, other things being equal. An increase of 1000 persons in the population of the origin area of visitors results in an increase of only about 70 visitors to a river park. The effect of additional acreage on visitors to river parks is not statistically significant, however, indicating that acreage is probably not a good measure of attractiveness. These parks are quite different from each other--Letchworth, for example, is dominated by a large canyon and Taughannock features a high waterfall. Such differences are difficult to represent as independent variables and,

therefore, cannot be accounted for explicitly in statistical analysis or planning equations.

74. In the log-log version, the coefficients are interpretable as elasticities. Thus a 10 percent increase in the population of the origin counties induces a 4-6 percent increase in visits for all parks except the stream parks. This is rather low, but within the range observed in the literature. With respect to hours, the elasticities of visits are all quite large, varying from -2.1 to -3.8 for all but the stream parks. This indicated a steep distance decay function in line with other researchers' results. Finally, the elasticity of visits with respect to park acreage is significant only for river parks and stream parks, but even here they are strikingly different. Perhaps acreage is an inappropriate measure of park attractiveness. Table 6 suggests that number of picnic tables in large lake parks is a significant indicator of attractiveness (Model 5), but this is the only type of park having a specific attribute with a statistically significant coefficient using the log-log model. Another explanation of the lack of significance of park acreage is that, within the range of acreages observed, recreationists do not consider this a very important distinction among parks. As long as some minimum size is met any park of a general type may suffice.

75. The location of many of the sample parks around New York City may contribute to the relatively poor levels of goodness of fit and strange regression coefficients observed in some of the models. For instance, the effect of population size on visits may be diminished in magnitude because of the huge population located in the New York metropolitan region in comparison with the rest of the State. It may therefore be desirable to separate New York City area parks from upstate parks. Similarly, the distance decay effects may be different upstate than downstate because of the great difference in population mass. Combining upstate and downstate parks may then result in a poorly fitting equation with coefficients that describe neither upstate nor downstate parks.

76. With regard to the usefulness of the models, the levels of R^2 and the magnitudes of the regression coefficients in some equations give us moderate confidence in predicting the number of visits to any park

in a given year. Of course, the goodness of fit varies from park type to park type and from model to model. The standard error of estimate of each regression equation lowers our feeling of confidence in the models, however. For example, the standard error of estimate on Model 2 for river parks ($R^2 = 0.57$) is 37,000 visits which compares with a mean of 36,000 visits for these parks. Clearly the ability to predict visits to these parks is quite limited. To take another example, the standard error of estimate on Model 5 for small lake and pond parks ($R^2 = 0.61$) is from 0.36 to 2.80 times the estimated number of visits ($e^{\pm 1.0294}$). The inability to predict well with this model increases as the number of visits increases in this case.

77. Finally, observe that one source of the disappointing results may be the quality of the data available. The sample of recreationists was small in comparison with the annual number of visitors, often less than one percent of the annual total. Therefore, it can be expected that our results would reflect this in that joint frequencies of visitor, origin area, and distance observations may be somewhat unrepresentative of the actual pattern. Small sample sizes in relation to the variety of independent variables taken in combination may thus lower the signficance of the coefficients.

Analysis of American River and Sacramento region formulations

78. The Corps of Engineers has conducted a series of analyses whose ultimate purpose was to derive models of recreation use which could be readily applied by planners throughout the Corps. The intent was to produce models whose emphasis is on simplicity of application and accuracy of prediction rather than on academic elegance. The American River study (U. S. Army Engineer District, Sacramento 1976) and earlier analysis of data from the Fort Worth and Sacramento Districts (Brown and Hansen 1974) are the major results of this research.

79. The basic linear formulation of the American River study was:

$$\text{VISITATION}_{ij} = a + b\,\frac{\text{TOT POP}_i}{\text{DISTANCE}_{ij}} + c\,\frac{(\text{TOT POP}_i)(\text{IRR ACRES}_j)}{\text{DISTANCE}_{ij}} \qquad (20)$$

where TOT POP is defined as above, but VISITATION is total activity hours of visitation by residents of origin i at park j , DISTANCE is the number of road miles between i and j , and IRR ACRES is the number of acres of irrigated turf at the park destination.

80. The American River study yielded an R^2 of 0.60 for this model with a t-statistic of 7.47 for coefficient b and a t-statistic of 13.6 for coefficient c .

81. The New York State data differ somewhat from the American River data. Therefore in testing the American River Model using the New York data, it was necessary to make some changes in definitions of the variables. Thus, the American River Model was interpreted using variables. as defined earlier in this report:

$$\text{VISITS} = a + b\,\frac{\text{TOT POP}}{\text{HOURS}} + c\,\frac{(\text{TOT POP})(\text{ACRES})}{\text{HOURS}} \tag{21}$$

82. The regression results yielded by this model using New York data are given in Table 9. It will be seen that both R^2 values and t-statistics of the coefficients are generally low. Perhaps worse is the fact that the variable $\frac{(\text{TOT POP})(\text{ACRES})}{\text{HOURS}}$ generally appears with a negative sign. Standard errors of estimate were typically one or one-and-one-half times as large as the mean of the dependent variable.

83. In the study of parks in the Sacramento, California, region, the Corps of Engineers (Brown and Hansen 1974) added a variable to describe substitute parks. The resulting equation, in terms compatible with the New York data, is of the following form:

$$\text{VISITS} = a + b\,\frac{\text{TOT POP}}{\text{HOURS}} + c\,\frac{(\text{TOT POP})(\text{ACRES})}{\text{HOURS}} + d\,\frac{\text{TOT POP}}{(\text{HOURS})(\text{C WATER})} \tag{22}$$

This form was tested using the New York data, with one exception. Since the variable $\frac{(\text{TOT POP})(\text{ACRES})}{\text{HOURS}}$ appeared with an illogical sign in fitting equation 21 to the New York data, it was dropped from the formulation of equation 22. In addition, C ACRES was tested as an

Table 9

Regression Results: American River Type Model

	Constant	TOT POP / HOURS	(TOT POF)(ACRES) / HOURS	SE	R^2
Lake Parks	2.0513	0.0416 (<u>2.52</u>)	-0.00001 (0.50)	9.066	0.1182
Ocean Parks	35.3851	0.1062 (<u>3.88</u>)	-0.00004 (<u>2.59</u>)	117.928	0.3053
Pond Parks	5.9476	0.0219 (<u>5.92</u>)	-0.00001 (1.82)	33.738	0.2997
River Parks	11.7914	0.0275 (0.79)	0.00002 (1.26)	38.580	0.5238
Stream Parks	9.3646	0.0015 (1.43)	-0.00001 (0.20)	21.018	0.0155

Notes: Numbers in parentheses are t-statistics.
Underlined coefficients are significant at the 0.05 level.

alternative to C WATER . The regression results are given in Table 10.

84. The results are similar to those of the American River Model in terms of R^2 values and standard errors. Illogical signs, however, appear to be a problem only for lake parks, and the t-statistics of individual coefficients are generally higher for lake and river parks but lower for ocean, pond, and stream parks.

85. A summary comparison is made in Table 11 of the results using the American River Model, the Sacramento region model, and linear Models 1 and 2 described in paragraph 49 and following paragraphs. It is evident from this comparison that in this application the simply linear models generally yielded superior results to the American River and Sacramento region model formulations.

Use of the Models for Planning Purposes

86. In evaluating a proposed park or set of parks, it is desirable to have a model fitted to the region in question and which requires a limited number of variables for which data are readily available and yields results which do not have excessive errors.

87. Generally all the models tested in this report meet the first criterion. The models with basic variables (population, travel time, and size of park), however, require much less data and are much easier to fit than those which must choose statistically from a larger list of variables. On this basis, the "models using basic independent variables only" are preferable for planning use.

88. None of the models tested with New York State data, however, entirely satisfies the second criterion. Even the results for river parks, which yield R^2 values in the 0.5 to 0.6 range, have standard errors of estimate that are approximately as large as the mean of the dependent variable. In addition, examination of the patterns of residuals indicates that the error is heteroscedastic. It is therefore concluded that professional judgement must be used in interpreting the results if the models fitted to New York State park data are used for planning evaluations.

Table 10

Regression Results: Sacramento Region Type Models

		Constant	TOT POP / HOURS	TOT POP / HOURS x C WATER	TOT POP / HOURS x C ACRES	SE	R^2
Lake Parks	a)	2.0564	0.0364 (<u>2.91</u>)	-0.0149 (0.21)	----	9.081	0.1153
	b)	2.0595	0.0364 (<u>2.91</u>)	----	-0.0090 (0.17)	9.081	0.1153
Ocean Parks	a)	46.3802	0.0372 (<u>2.55</u>)	0.0670 (1.83)	----	122.419	0.2514
	b)	46.1812	0.0376 (<u>2.58</u>)	----	0.0658 (1.80)	122.576	0.2494
Pond Parks	a)	0.9678	0.0183 (<u>5.82</u>)	0.1838 (<u>2.99</u>)	----	32.710	0.3418
	b)	1.8520	0.0182 (<u>5.71</u>)	----	0.1790 (<u>2.67</u>)	33.034	0.3287
River Parks	a)	13.9174	0.0695 (<u>7.27</u>)	----	----	38.799	0.5088
	b)	13.8015	0.0694 (<u>7.16</u>)	----	0.0375 (0.10)	39.181	0.5089
Stream Parks	a)	9.5729	----	0.0019 (1.76)	----	20.871	0.0222
	b)	9.8243	-0.0005 (0.34)	----	0.0031 (1.65)	20.816	0.0343

Notes: Numbers in parentheses are t-statistics.
Underlined coefficients are significant at the 0.05 level.

Table 11

Overall Comparison of Alternative Models: New York State Park Data

	Model 1		Model 2			
	Basic Variables	Basic & Additional Variables	Basic Variables	Basic & Additional Variables	American River Model	Sacramento River Model
Lake Parks						
R^2	0.2117	0.2571	0.2141	0.3216	0.1182	0.1153
SE/mean	8.71/5.47	8.26/5.47	8.63/5.47	8.08/5.47	9.07/5.47	9.08/5.47
Ocean Parks						
R^2	0.3283	0.3662	0.3409	0.4020	0.3053	0.2514
SE/mean	118.97/102.12	112.64/102.12	117.85/102.12	110.81/102.12	117.93/102.12	122.42/102.12
Pond Parks						
R^2	0.3292	0.3414	0.3250	0.3143	0.2997	0.3418
SE/mean	33.42/21.68	33.11/21.68	33.52/21.68	33.58/21.68	33.74/21.68	32.71/21.68
River Parks						
R^2	0.5211	0.5556	0.5710	0.6058	0.5238	0.5089
SE/mean	39.49/35.63	38.04/35.63	37.38/35.63	35.83/35.63	38.58/35.63	38.78/35.63
Stream Parks						
R^2	0.1734	0.2361	0.1523	0.2277	0.0155	0.0222
SE/mean	19.40/10.23	18.51/10.23	19.64/10.23	18.75/10.23	21.02/10.23	20.87/10.23

Table 12

Comparison of Observed Visits with Estimated

Visits Using a Sacramento Region Type Model

Fitted to New York State Parks System Data

Park	Estimated Visits (000's)	Observed Visits (000's)	Ratio Est/CB
Lake Parks			
Cayuga	116	105	1.1043
Fairhaven Beach	87	158	0.5515
Sampson	101	56	1.7[illegible]
Glimmerglass	67	52	1.2867
Total	372	372	0.9992
Ocean Parks			
Jones Beach	1314	1143	1.1501
Captree	805	1311	0.6144
Heckscher	1271	793	1.6026
Sunken Meadow	998	1144	0.8721
Total	4389	4391	0.9995
Pond Parks			
Belmont Lake	460	463	0.9939
Rockland Lake	791	785	1.0082
Mohansic	274	342	0.8009
Clarence Fahnstock	253	82	3.0844
Chenango Valley	130	236	0.5487
Total	1907	1907	0.9999
River Parks			
Bear Mountain	1177	1182	0.9957
Taughannock Falls	355	233	1.5204
Letchworth	357	473	0.7545
Total	1889	1888	1.0001
Stream Parks			
Valley Stream	214	117	1.8330
Bayard Cutting Arb.	123	51	2.4023
Nissequogue	58	18	3.2227
Taconic	134	75	1.7939
J.B. Thatcher	136	435	0.3124
Bowman Lake	87	35	2.4416
Buttermilk Falls	77	102	0.7623
Fillmore Glen	57	31	1.8750
Watkins Glen	134	208	0.6451
Stony Brook	106	90	1.1752
Chittenango Falls	134	85	1.5789
Clark Reservation	64	93	0.6936
Battle Island	87	33	2.5939
Macomb Reservation	19	59	0.3223
Total	1430	1432	0.9950

89. It is instructive, therefore, to examine the predictions which would result from applying the fitted equations to the New York parks. That is, assume for example that the Sacramento equations for each park type (models a for each park type, as given in Table 10) are available to a planner charged with the responsibility of planning parks in New York. He could gather data on each of the independent variables for a proposed park and its associated pairs of residential origins. Thus, he could compute $\frac{\text{TOT POP}}{\text{HOURS}}$ for each proposed park destination residential origin pair. Similarly he could compute C WATER for each of the residential locations, and them compute the variable $\frac{\text{TOT POP}}{(\text{HOURS})(\text{C WATER})}$. Finally, he could multiply the computed value of each variable by its corresponding regression coefficient, add in the constant from models a in Table 10, and thus derive an estimate of the number of visits from each residential origin area to the park. These could then be summed to yield the total estimated number of trips to the proposed park.

90. Such a computation has been made for each of the parks in our sample. Since we know the number of visits to each park, we can compare it with the estimated number and thus see how well our equations estimate the actual number of visits. This comparison is given in Table 12.

91. It will be noted in Table 12 that for any park type as a whole, the estimated number of visits is equal to the observed number (except for rounding). This is because the regression line runs through the mean of the data.

92. The planner, however, is more likely to be interested in making estimates for a particular park, and for these the ratio between estimated and observed varies widely. The results are best for river parks, but even for them the estimates differ substantially: estimated visits are equal to observed visits for Bear Mountain State Park, but are only 75 percent of observed for Letchworth State Park, and are 152 percent of observed for Taughannock Falls.

PART IV: CONCLUSIONS

93. The results using the New York data are disappointing, but do not necessarily mean that recreation demand modelling cannot yield useful results. It should be borne in mind that the New York visitor survey data were gathered as part of a general descriptive study of the parks and their use and not with the specific intention of modelling recreation demand. For that purpose, substantially larger visitor samples would have been desirable. If possible, future analyses of recreation demand should include the specification of the visitor survey so that the details and scope of the survey data are appropriate for the analysis.

94. No matter what models are developed, they could be misleading if not applied with great discretion by planners in regional offices. The planner should satisfy himself that the model used is appropriate to his region or subregion and to the type of park being analyzed. He should also become very familiar with the accuracy of the results to be expected.

95. In order to determine whether the model is appropriate, he should check to see whether data for the problem to be analyzed fall within the range of the data that had been used for developing the model. If the model was not developed explicitly for the planner's region, he should also consider whether the nature of his region is similar to that used for model development. Are there any evident differences in behavioral characteristics and are there any unusual differences in the physical characteristics of the region and its parks as compared with the model development region? In order to take into consideration the expected accuracy of results, the planner should note the overall goodness-of-fit as expressed by R^2, the interpretation of the coefficients (their signs and magnitudes), and the standard error of estimate.

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APPENDIX A: NEW YORK STATE PARK VISITOR SURVEY QUESTIONNAIRE

PARK VISITOR SURVEY
SUMMER, 1976

PARK NAME ______ SURVEYOR'S NAME ______

DATE ______ TIME ______ LOCATION/COUNT ______ WEATHER ______

OBSERVE: AGE ______ SEX ______ ETHNIC GROUP ______

HANDICAP REQUIRING FACILITY MODIFICATION (SPECIFY)

______

ACTIVITY BEING ENGAGED IN ______

PARK INFORMATION

Last summer, did you use: (NOTE: Check if "yes". Work across until a "no" is obtained).

		at all	more than 5 times	more than 10 times	more than 20 times
this park	:	___	___	___	___
other N.Y.State parks	:	___	___	___	___
county parks	:	___	___	___	___
neighborhood OR facilities	:	___	___	___	___
private OR facilities	:	___	___	___	___

Do you visit this park more often on weekdays ____ or weekends ____ ?

Would you like to visit this park more often than you do? Yes ____ No ____

If "Yes" why don't you? ______

If "No" why not? ______

Would you buy an annual parking pass to state parks for: $50 ____ $25 ____ $10 ____

How did you hear about this park? ______

What are the kinds of things you typically do here? ______

______

Of these, which are most important to your coming here? ______

In general, what was the principal reason for your recreation trip today? ______

______

What if anything about the park or its programs would you like to see changed? ______

______

What is the best thing about this park? ______

What is the worst thing about this park? ______

Overall do you think New York State does a: good ____ fair ____ or poor ____ job providing outdoor recreation? EXPLAIN: ______

______

TRIP INFORMATION

How did you get here today? Auto ____ Charter Bus ____ Commercial Bus ____ Train ____ Bicycle ____ Walked ____ Other (specify) ______

Where did you come from today? Home ____ Summer Home ____ Hotel/Motel ____ Campground in Park ____ Other Campground ____ Friend's/Relative's ____ Other (specify) ______

How long did it take you to get here today? ______

How long do you expect to stay today? ______

PERSONAL INFORMATION

(State: "The following questions will help us to make statistical profiles of our park users for use in reports in support of our Budget and programs. Please answer them as fully as possible.")

Is your group: A Family Group ____ Organized Group ____ Friends ____ Just Yourself ____

How many in your party are:

1. 6 years or under ____
2. 7 to 19 years ____
3. 20 to 34 years ____
4. 35 to 49 years ____
5. 50 to 64 years ____
6. 65 or older ____

Where do you live? (Ask County) ______, ______, ______
(city/town/village) (county/province) (state/country)

What are your favorite forms of summer outdoor recreation? ______

______

How many registered motor vehicles does your family own? ______

What is your occupation? (Note: If only employer or a broad category such as "professional" is given ask for further elaboration.) ______

Which is your approximate education category? (Show Card)

1. grade school
2. high school
3. vocational school
4. community college
5. college
6. graduate school
7. other (specify) ______

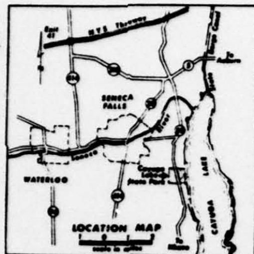
Which is your approximate family income category? (Show Card)

1. less than $5,000
2. $5,000 to $9,999
3. $10,000 to $14,999
4. $15,000 to $19,999
5. $20,000+

APPENDIX B: DESCRIPTION OF THE PARKS ANALYZED

FINGER LAKES STATE PARK AND RECREATION COMMISSION

CAYUGA LAKE STATE PARK



This 190 acre park provides excellent facilities for its patrons including a large tent and trailer camping area, a cabin colony overlooking the lake, wooded picnic areas, swimming facilities and playgrounds.

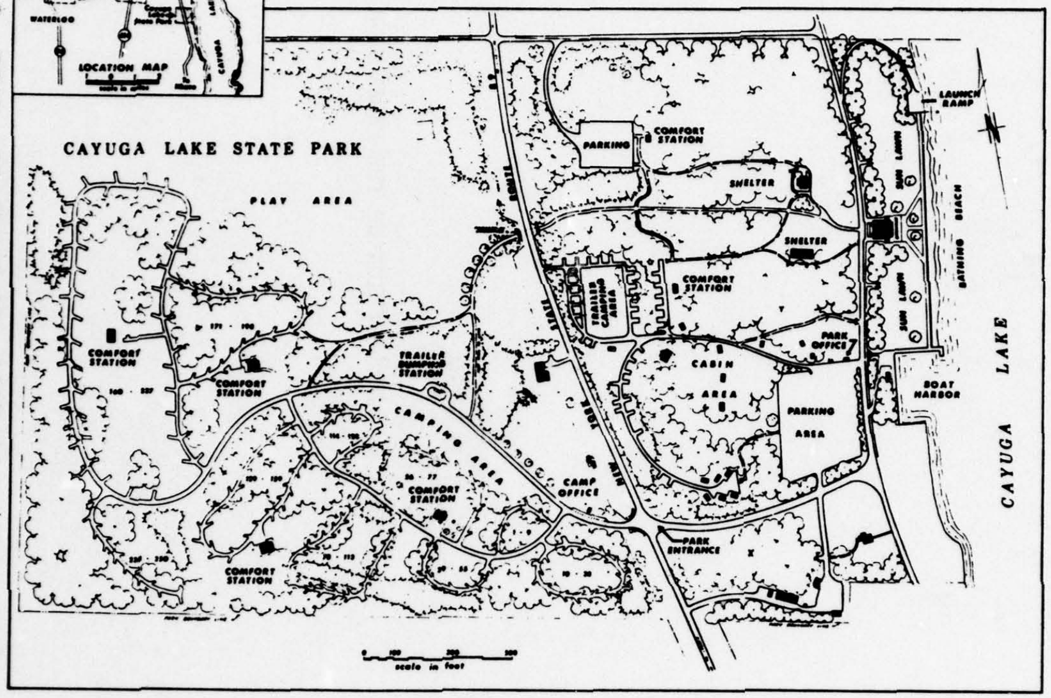
The waterfront, with its sand beach, bathhouse and sunning lawns, also affords a boat launching ramp and small boat harbor with pump-out station.

The park is situated on the northwest shore of the lake, one of the largest of the Finger Lakes. Forty miles long with a maximum depth of 435 feet, this beautiful lake is popular with boatmen and particularly attractive to fishermen. Its varied depth and zones afford ideal environment for many species of game fish including bass, pickerel, northern pike, and lake trout as well as bullheads.

Nature lovers and bird watchers will enjoy a visit to the Montezuma Marsh, a Federal Wildlife Refuge, about five miles north of the park. Canada geese, ducks, other waterfowl and wildlife species can be observed here through most of the year.

"Red Jacket," a famous Indian Chief, was born near here and is commemorated with a monument on Route 89 about two miles south of the park entrance.

This park will celebrate its 50th anniversary in 1978. The first parcel of land, 51 acres, was purchased on December 3, 1927, and the park opened to the public during the summer of 1928.



FINGER LAKES STATE PARK & RECREATION COMMISSION

FAIR HAVEN BEACH STATE PARK

Fair Haven Beach State Park, with its quarter-mile long white sand beach, is the "sea-shore of the lake country." This 862 acre park is located in Cayuga County along the shore of Lake Ontario and is a mecca for sunbathers, swimmers and campers.

Eroding drumlins create high bluffs along the shore which are among the highest to be found along Lake Ontario.

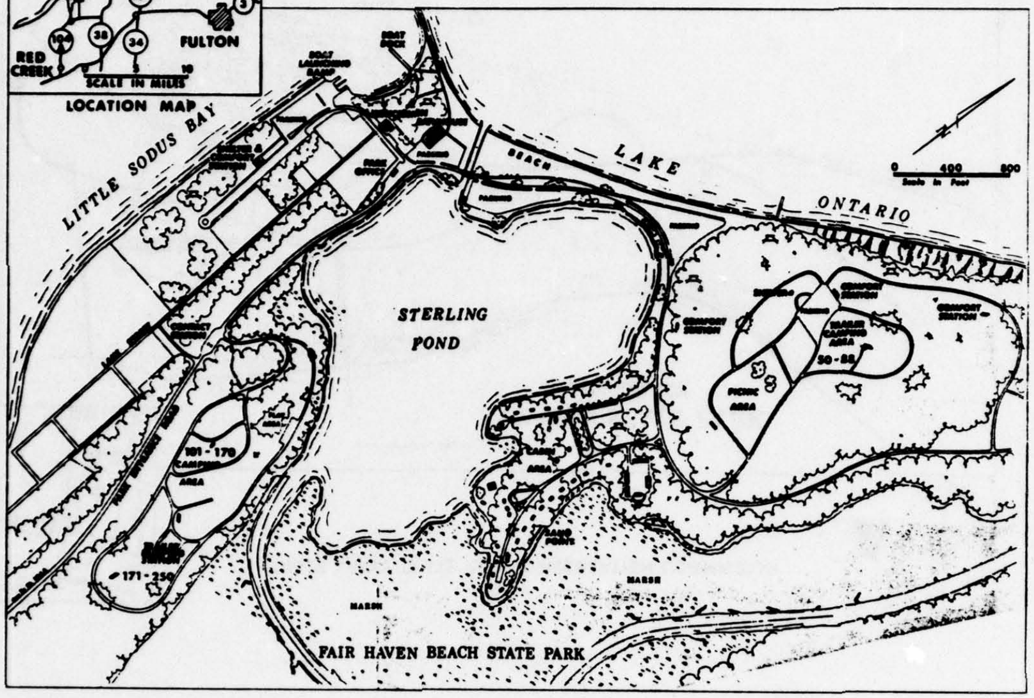
The camping areas are well separated from the day-use facilities. A large cabin colony is on a secluded sand point. Tent camping is located on a hill along the south shore of Sterling Pond. Trailer camping area occupies a plateau on the bluff. Wooded picnic areas are located in several sections of the park.

Marine facilities include a launching ramp and transient docking on Little Sodus Bay and a marine pumping station.

Fishing is good at and near the park. Northern pike, bass, perch and bullheads are the dominant species.

The marshlands are nesting areas for ducks, geese and other wildlife. Sterling Pond harbors many kinds of aquatic plant life.

LOCATION MAP



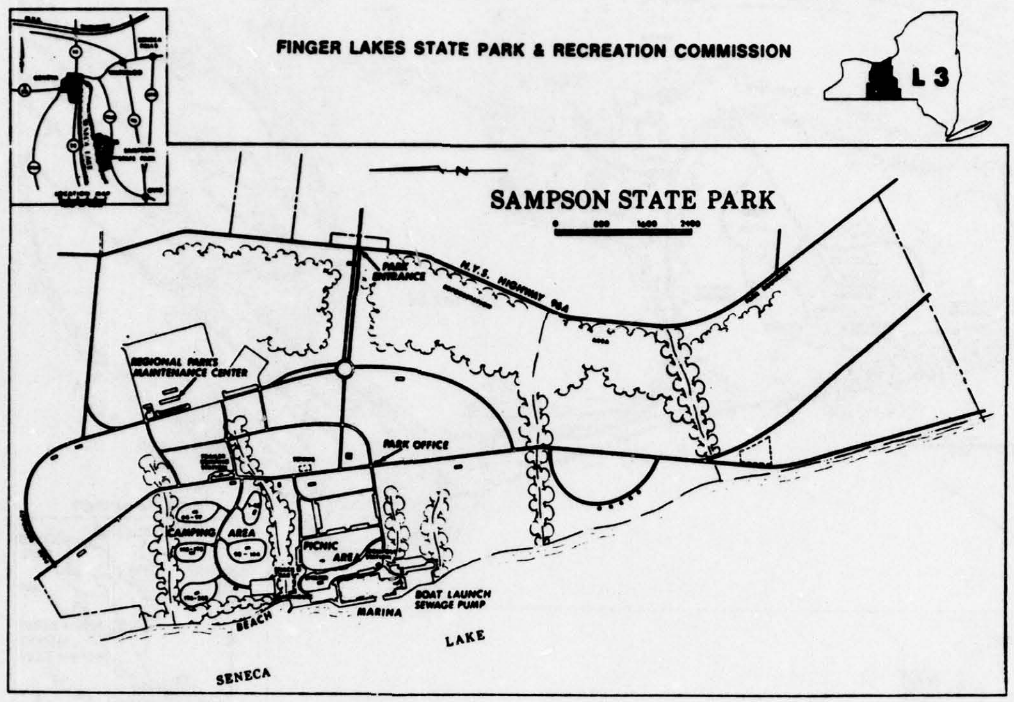
SAMPSON STATE PARK

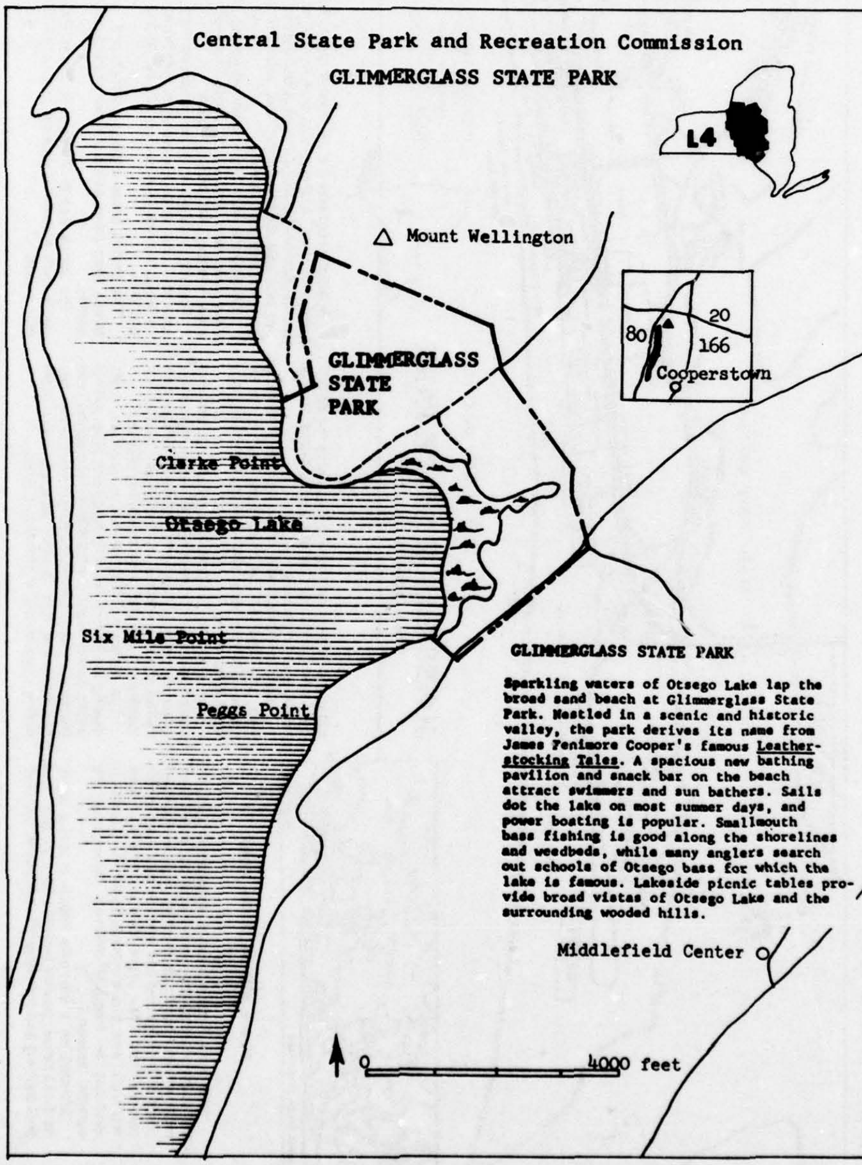
Sampson State Park, overlooking Seneca Lake, occupies the location of a former naval training station. Prior to World War II, these 1852 acres were rural farmland. Within a few months after Pearl Harbor the site was quickly transformed into a bustling military center, housing and training 40,000 men at a time.

Declared surplus by the Federal Government in 1960, it was purchased by the State of New York for park and recreation purposes. The unique tract included nearly three miles of waterfront on the east shore of Seneca Lake.

Nearly all of the three to four hundred buildings have been removed, but the site retains some of its military character. The huge drill fields are now playfields, and some of the more permanent buildings are used for park purposes. The recreation facilities include swimming, picnicking, camping, playgrounds, boat launching, and a marina.

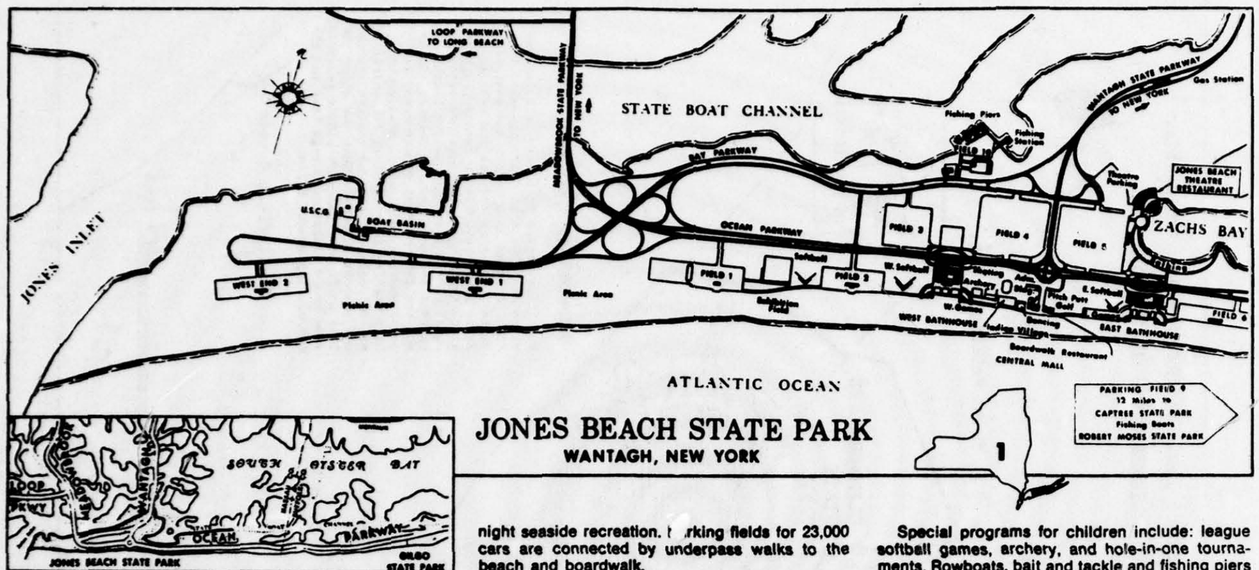
Fishing is popular on Seneca Lake, which is 600 feet deep, the deepest of all the Finger Lakes.





GLIMMERGLASS STATE PARK

Sparkling waters of Otsego Lake lap the broad sand beach at Glimmerglass State Park. Nestled in a scenic and historic valley, the park derives its name from James Fenimore Cooper's famous Leather-stocking Tales. A spacious new bathing pavilion and snack bar on the beach attract swimmers and sun bathers. Sails dot the lake on most summer days, and power boating is popular. Smallmouth bass fishing is good along the shorelines and weedbeds, while many anglers search out schools of Otsego bass for which the lake is famous. Lakeside picnic tables provide broad vistas of Otsego Lake and the surrounding wooded hills.



JONES BEACH STATE PARK

New York State's famous oceanfront park on the south shore of Long Island about 33 miles from midtown Manhattan is reached by car from all parts of the Metropolitan area by parkways. Train service from New York City to Freeport and Wantagh, with bus connections to the Beach, is available at frequent intervals throughout the summer season.

Situated on a 6½ mile beach of white sand, its 2,413 acres provide facilities for surf, bay, and pool bathing and for many other forms of day and night seaside recreation. Parking fields for 23,000 cars are connected by underpass walks to the beach and boardwalk.

Near the Central Mall is the 18-hole Pitch and Putt Golf Course. The holes vary from 30 to 90 yards in length with grass greens and seashore sand filled traps.

Jones Beach provides countless recreational opportunities. For the children there are playgrounds, kindergartens and an Indian Village with Indian folklore, games, and classes. In addition there are handicraft and swimming classes.

The program of special events includes: roller skating exhibitions, aquatic races and other events at the pools; talent contests and band concerts at the Music Shell; fishing contests; stargazing; circus days and free outdoor dancing every night during the summer at the Music Shell.

Special programs for children include: league softball games, archery, and hole-in-one tournaments. Rowboats, bait and tackle and fishing piers are available for bay fishing, and beach areas are set aside for surf fishing.

Bathhouses with lockers and dressing rooms have swimming and diving pools illuminated for night bathing, and beach shops.

Food is available at fourteen refreshment pavilions and four large restaurants. Restaurant and cafeteria service is provided all year at the Central Mall.

The games areas include shuffleboard, paddle tennis, ping-pong, *outdoor roller skating, and field* games.

The Jones Beach Theatre at Zachs Bay presents each summer a musical production at popular prices.

LONG ISLAND STATE PARK AND RECREATION COMMISSION

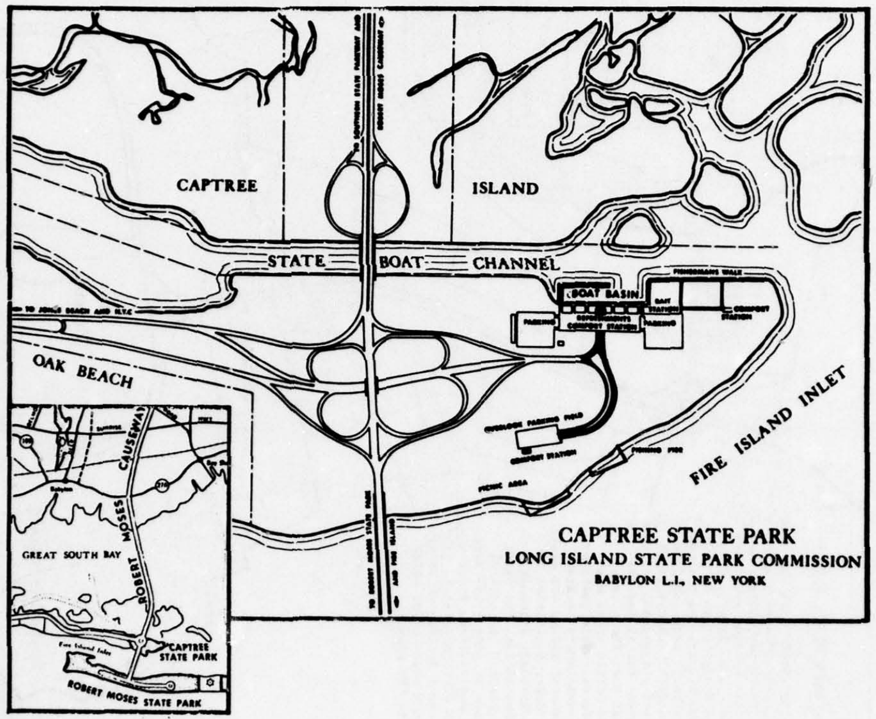
CAPTREE
STATE PARK

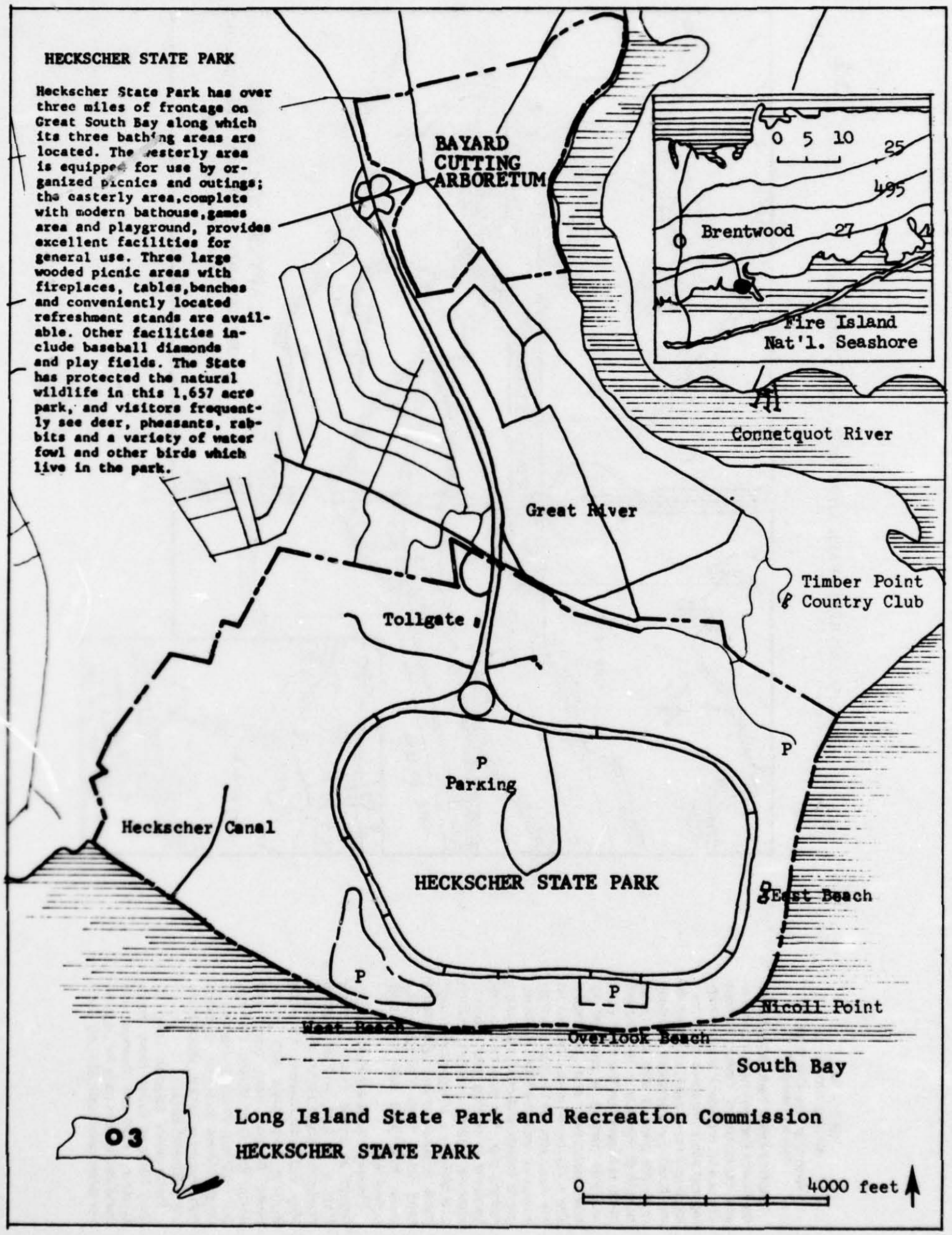
West Islip, New York 11795
Tel: 516 669-0449

Captree State Park, situated on the Ocean Parkway near the southerly terminus of Robert Moses Causeway, provides complete fishing and picnic facilities. Open fishing boats leave daily, charter fishing boats by reservation. Fishing from the piers is also a popular feature of the park. A refreshment stand is located on the north dock and free parking is provided for both fishermen and picnickers. The main picnic area, located on the south side of the park, is fully equipped with comfort stations, picnic tables, charcoal grills and a fishing pier. The east picnic area contains a fishing pier, tables, charcoal grills, comfort station and children's playground equipment. Excursions and sightseeing trips leave from Captree dock daily. Moonlight sails are also scheduled.

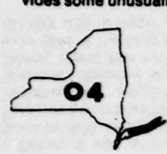
Fishing clinics are held on Saturdays at Jones Beach Fishing Piers at 10 A.M. and at Captree Overlook Piers at 2 P.M. starting in May. Subjects covered: Flounder Fishing from piers and boats, Fluke Fishing from piers and boats, Park Boat Bottom Fishing, Surf Fishing, Snapper Fishing — When, Where and How to catch fish, Spinning Tackle, Black Fishing — Striped Bass.

Fishermen's Special: Long Island Railroad trains leave Pennsylvania, Flatbush Avenue and Jamaica Stations daily for Captree. For information call: 516-669-0449.




HECKSCHER STATE PARK
Heckscher State Park has over three miles of frontage on Great South Bay along which its three bathing areas are located. The westerly area is equipped for use by organized picnics and outings; the easterly area, complete with modern bathouse, games area and playground, provides excellent facilities for general use. Three large wooded picnic areas with fireplaces, tables, benches and conveniently located refreshment stands are available. Other facilities include baseball diamonds and play fields. The State has protected the natural wildlife in this 1,657 acre park, and visitors frequently see deer, pheasants, rabbits and a variety of water fowl and other birds which live in the park.
BAYARD CUTTING ARBORETUM
0 5 10
25
495
Brentwood
27
Fire Island Nat'l. Seashore
Connetquot River
Great River
Timber Point Country Club
Tollgate
P
Parking
P
Heckscher Canal
HECKSCHER STATE PARK
East Beach
P
P
Nicoll Point
West Beach
Overlook Beach
South Bay
03
Long Island State Park and Recreation Commission
HECKSCHER STATE PARK
0
4000 feet

SUNKEN MEADOW STATE PARK



Sunken Meadow State Park, located on Long Island Sound, is one of the safest and most attractive bathing beaches on Long Island. A modern bathhouse contains accommodations for about 2,700 bathers.

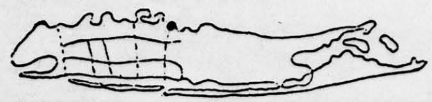
A boardwalk, demolished by the hurricane of 1944 and replaced the following year, enjoys great popularity.

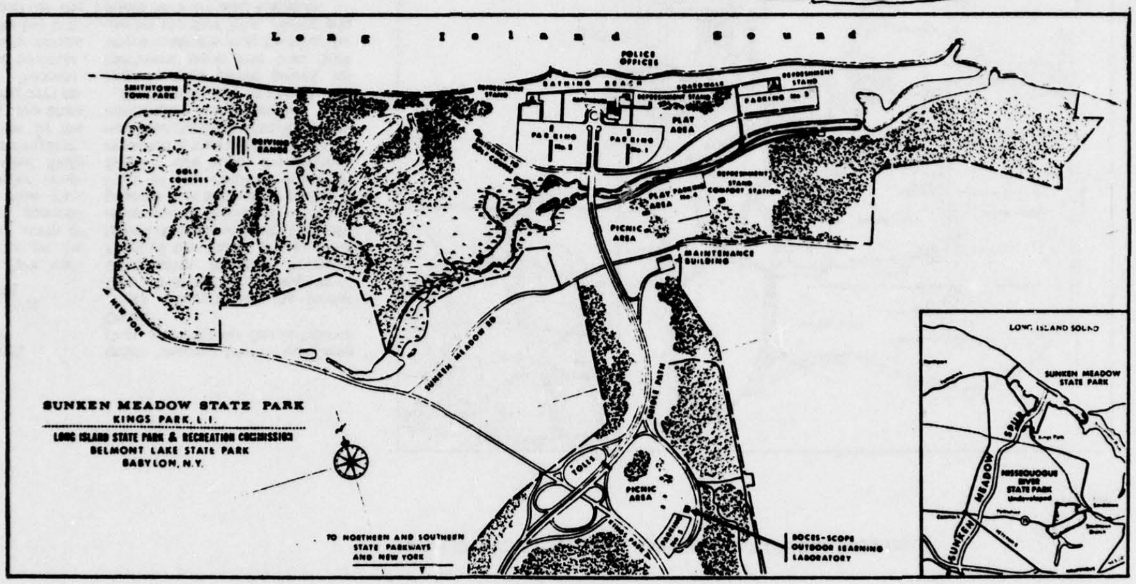
The upland wooded section of the park provides some unusually attractive picnic areas, bridle trails, hiking trails, play areas and site of the Outdoor Learning Laboratory.

A beautiful drive connects the bathing beach and picnic areas with the golfers' clubhouse, golf driving range and three popular nine-hole courses.

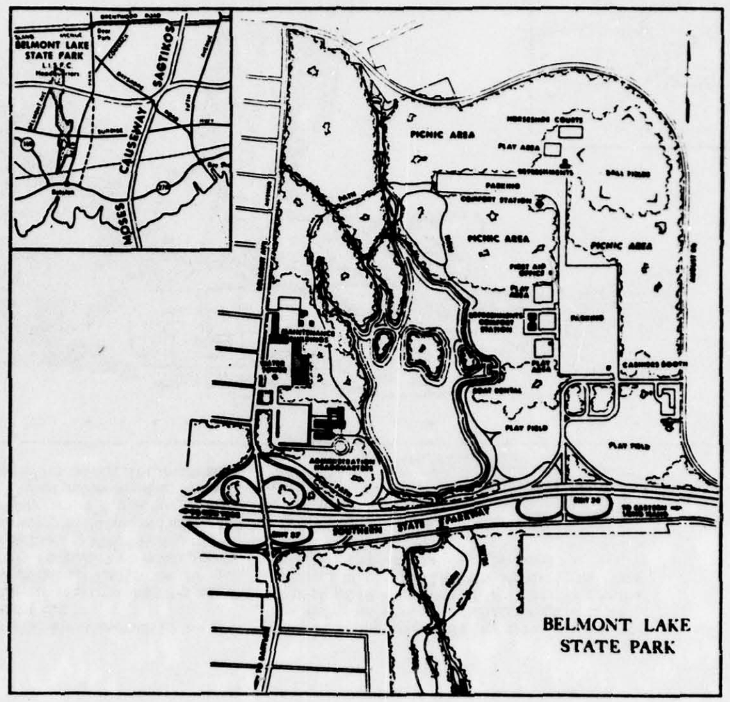
Nearby are the hamlets of Kings Park and Fort Salonga, site of a hilltop redoubt fortified by the British during the War of the Revolution. Not far away to the west is the boulder marking the spot where Nathan Hale infiltrated the British encampment obtaining information for General Washington. Hale was later captured and executed.

Located 46 miles east of New York City at the terminus of Sunken Meadow Parkway, the Park consists of approximately 1,266 acres.





LONG ISLAND STATE PARK AND RECREATION COMMISSION



BELMONT LAKE STATE PARK

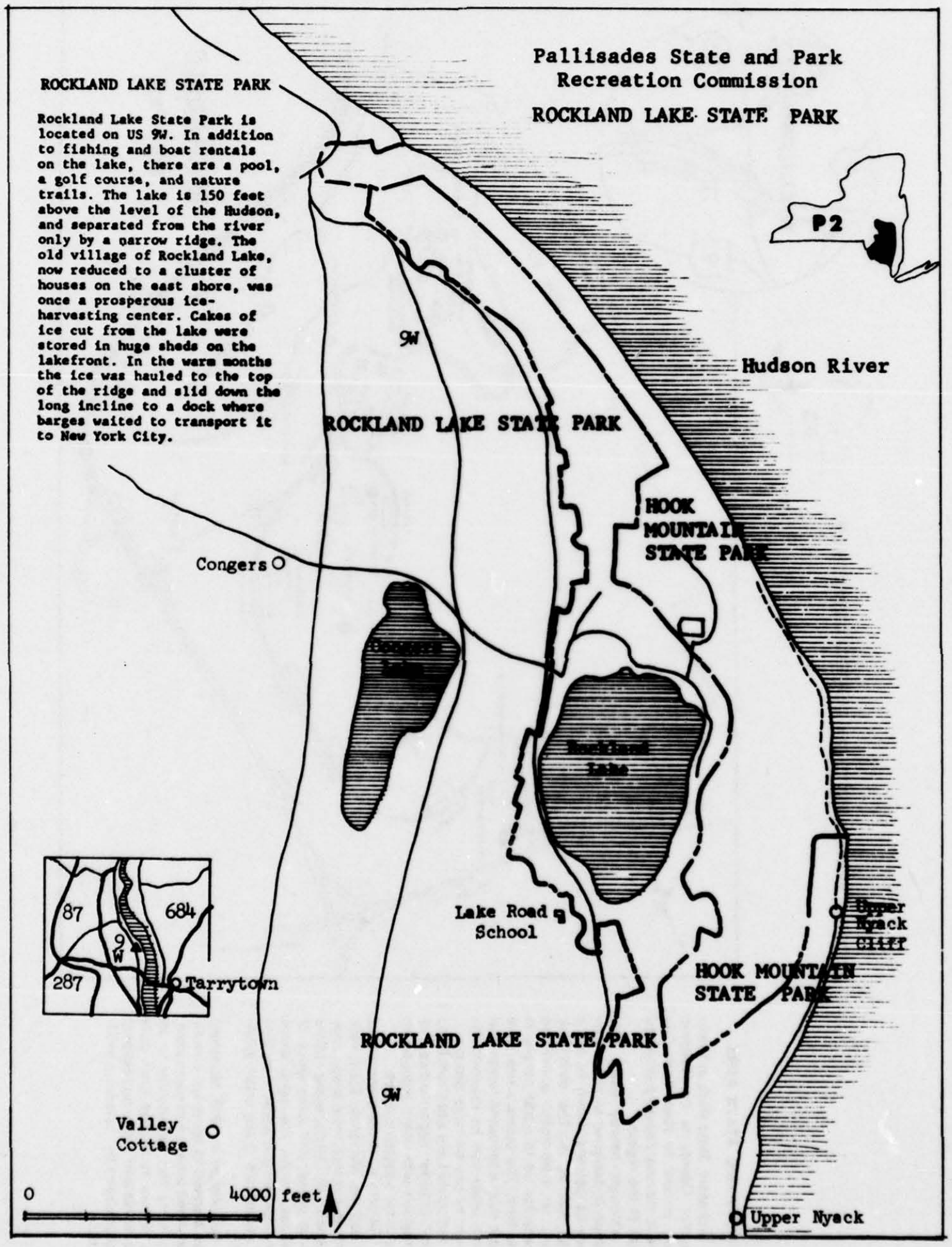
Babylon, New York 11702
Tel: 516 667-5055

Belmont Lake State Park, consisting of 459 acres, is on the Southern State Parkway, north of the Village of Babylon, approximately 42 miles from New York City and is administration headquarters of the Long Island State Park and Recreation Commission.

Before it was acquired by the State in 1926, Belmont Lake State Park was a horse breeding farm established by August Belmont, financier, diplomat and socialite. During World War I many horses were bred at the farm for the U.S. Cavalry and a large part of the estate became known as Camp Dam, an Army Air Corps Trainee Center.

Mrs. Belmont was the former Caroline Slidell Perry, daughter of Commodore Matthew Calbraith Perry of the Battle of Lake Erie fame in the War of 1812. Two cannons from a British warship engaged in that battle were placed in front of the Belmont mansion. When it was razed, the cannons remained in their original position, now near the main entrance of Administration Headquarters.

On the east side of the lake are large wooded picnic groves, refreshment stand and boat dock where rowboats may be hired for use on the park lake. Hiking and bridle trails are also available.


Pallisades State and Park
Recreation Commission
ROCKLAND LAKE STATE PARK
ROCKLAND LAKE STATE PARK
Rockland Lake State Park is located on US 9W. In addition to fishing and boat rentals on the lake, there are a pool, a golf course, and nature trails. The lake is 150 feet above the level of the Hudson, and separated from the river only by a narrow ridge. The old village of Rockland Lake, now reduced to a cluster of houses on the east shore, was once a prosperous ice-harvesting center. Cakes of ice cut from the lake were stored in huge sheds on the lakefront. In the warm months the ice was hauled to the top of the ridge and slid down the long incline to a dock where barges waited to transport it to New York City.
P2
9W
Hudson River
ROCKLAND LAKE STATE PARK
HOOK MOUNTAIN STATE PARK
Congers
Rockland Lake
Lake Road School
Upper Nyack Cliff
HOOK MOUNTAIN STATE PARK
87
684
9W
287
Tarrytown
ROCKLAND LAKE STATE PARK
9W
Valley Cottage
0
4000 feet
Upper Nyack

TACONIC STATE PARK & RECREATION COMMISSION

MOHANSIC STATE PARK

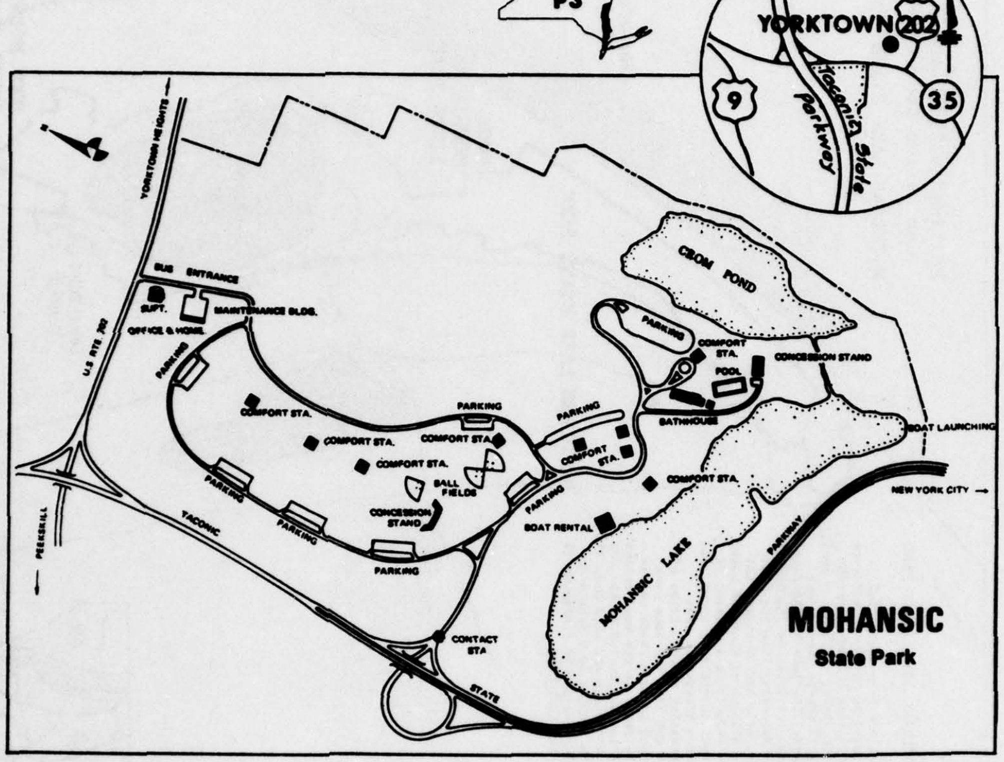
Mohansic State Park in Westchester County is the Taconic park closest to New York City and is the most heavily patronized park of the region.

Although heavily used, Mohansic is designed to accommodate its patrons within its more than 800 acres. The swimming pool is mammoth, providing space for up to 5,000 people at one time. The picnic areas have more than a thousand tables and some areas can be reserved for weekday use by large groups.

Mohansic Lake and Crom Pond both provide opportunities for fishermen with black bass-being the most popular species.

Yet with all of the pressures of its patrons, Mohansic State Park affords a retreat from urban congestion. Its landscaping offers green vistas, and even areas of solitude, while the lake shore provides an overwater view that is unavailable in any urban situation.

Established in 1958, Mohansic was planned to serve its densely populated area. It has succeeded, providing the opportunity to all its visitors to escape their daily pressures and enjoy recreational opportunities not otherwise available.



Taconic State Park and Recreation Commission

CLARENCE FAHNSTOCK STATE PARK

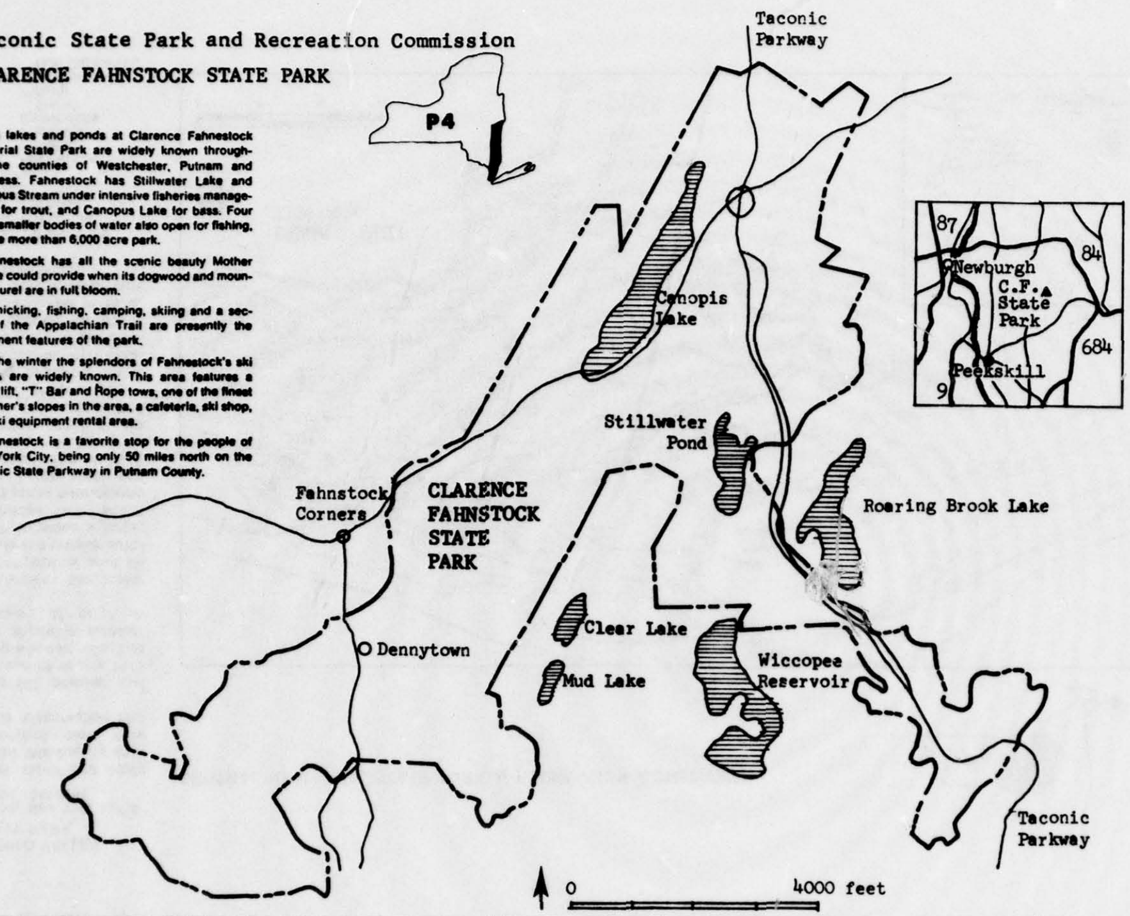
The lakes and ponds at Clarence Fahnestock Memorial State Park are widely known throughout the counties of Westchester, Putnam and Dutchess. Fahnestock has Stillwater Lake and Canopus Stream under intensive fisheries management, for trout, and Canopus Lake for bass. Four other smaller bodies of water also open for fishing, dot the more than 6,000 acre park.

Fahnestock has all the scenic beauty Mother Nature could provide when its dogwood and mountain laurel are in full bloom.

Picnicking, fishing, camping, skiing and a section of the Appalachian Trail are presently the prominent features of the park.

In the winter the splendors of Fahnestock's ski slopes are widely known. This area features a Poma lift, "T" Bar and Rope tows, one of the finest beginner's slopes in the area, a cafeteria, ski shop, and ski equipment rental area.

Fahnestock is a favorite stop for the people of New York City, being only 50 miles north on the Taconic State Parkway in Putnam County.



CHENANGO VALLEY STATE PARK

Chenango Forks, New York 13746
Tel: 607 648-5251

In 1927, as more and more people selected this beauty spot for a vacationland, New York State began its preservation and improvement.

Today it is still popular and is now composed of nearly 1075 acres of rolling wooded hills. The park provides shade in summer and a profusion of color in autumn.

The park contains two lovely lakes. The most popular spot on the lakeshore is the unique bathing area which includes a large, modern bathhouse with snack bar and dining plaza overlooking the waterfront. Large areas are available for picnicking, from a quiet spot for a single family to one of the largest group picnic shelters in the state, accommodating up to 700 people.

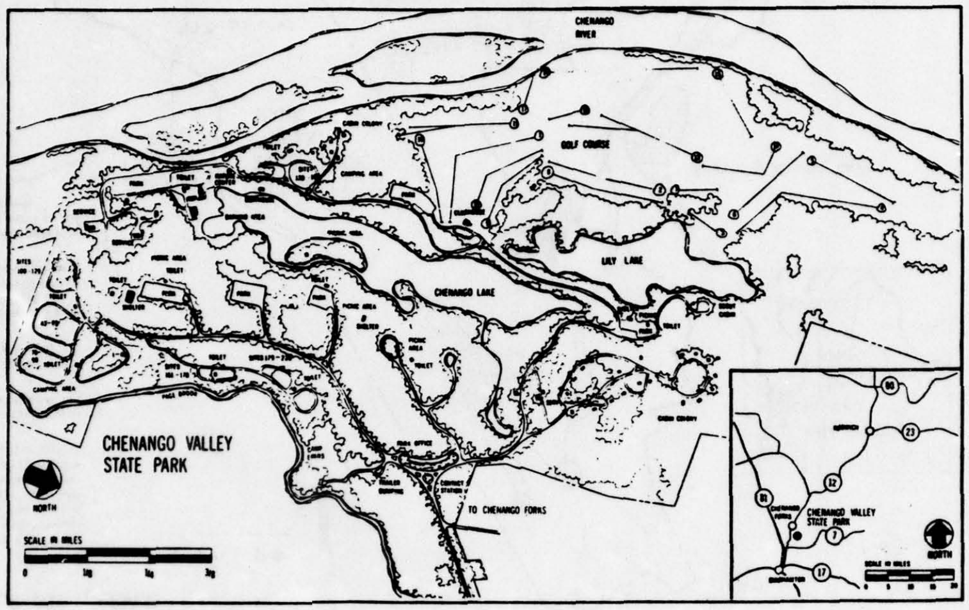
Golf, too, is available on a scenic 18-hole course with clubhouse. A portion of the old Chenango Canal, opened for travel in 1837 and abandoned in 1878, is still visible from several fairways of the golf course.

AVAILABLE FACILITIES

Tent-Trailer Sites. Std. — 178
Tent-Trailer Sites, with Elect. — 42
Cabins 2-room — 5
Cabins. 3-room — 19

Trailer Dumping Station	Refreshment Stand
Swimming	Playfields
Picnicking	Snowmobile Trails
Hiking Trails	Fishing
Group Picnic Area	Golf (Powered Golf Car Rental)
Boat Rental	
Bathhouse	

CENTRAL NEW YORK STATE PARK & RECREATION COMMISSION



BEAR MOUNTAIN STATE PARK

Bear Mountain State Park is one of the oldest parks in the Palisades region, dating back to the early 1900's. It is open all year and has an active winter program of ski jumps, sledding, ice skating, Christmas festivals, craft shows, winter carnivals and the facilities of the well-known Bear Mountain Inn which is open year-round. The Trailside Museums feature interesting exhibits of natural history and early American history and are visited by over 600,000 persons each year.

The park is situated in rugged mountains rising from the Hudson River. Nearby Hessian Lake, a beautiful, deep, clear mountain lake is used for boating, fishing, and for ice skating in the winter.

Bear Mountain is readily accessible by car, using the Palisades Interstate Parkway and by an excursion boat which makes daily trips from New York City in the summer. The facilities include: a large playfield, picnic groves (no fires are permitted), rowboat and pedal boat rentals, a 94 x 224 foot swimming pool, bathhouse with lockers and bathing suit and towel rentals, nature trails, overnight accommodations at the Bear Mountain Inn and Lodges, dining room, cafeteria and refreshment stand facilities, roller and ice skating rink in season, basketball and shuffleboard courts.

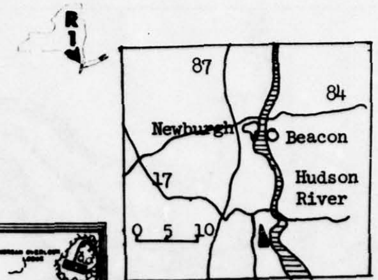
The Perkins Memorial Drive leads to the top of Bear Mountain where, from the Perkins Memorial Tower, there are spectacular views of the Hudson Highlands and Bear Mountain and Harriman State Parks.

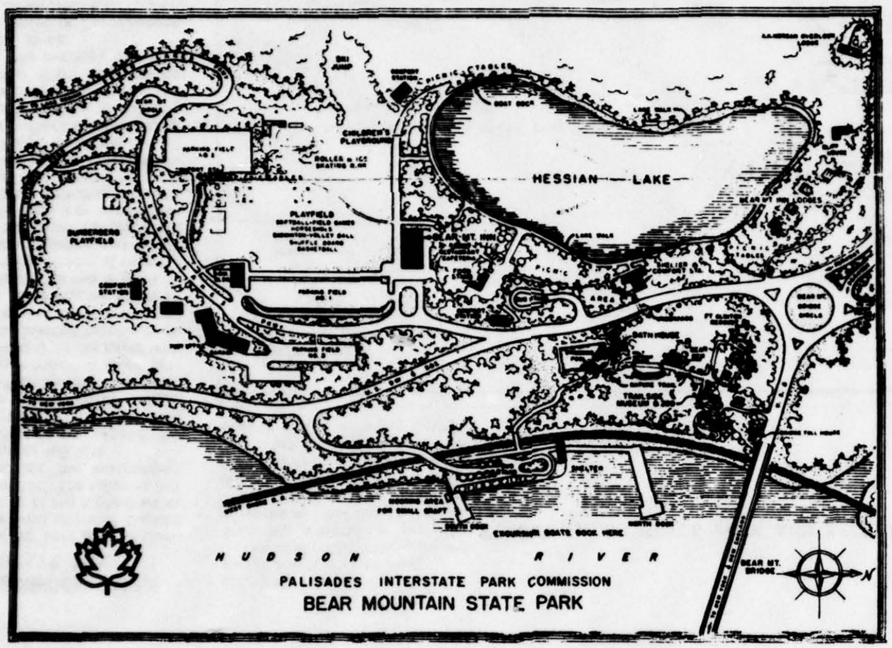
Parking is available for 1,100 cars in the summer and 3,500 cars in the winter.

Nearby are remains of two Revolutionary fortifications, Fort Clinton and Fort Montgomery.

Dogs on a leash are permitted.

PALISADES INTERSTATE PARK AND RECREATION REGION





TAUGHANNOCK FALLS STATE PARK

In this 825 acre park, located along the west shore of Cayuga Lake, is one of the highest water falls in the East. The falls are 215 feet high, and the surrounding cliffs range to 400 feet.

According to one legend, the name appears to have originated with the Indian word, "Taghkanic," which means "The great fall in the woods." A more dramatic legend links the name with that of a disgruntled Taughannock chieftan of the Delaware tribes who had to relinquish claim to certain lands. He led a band of warriors on a mission of revenge against the Cayugas and fell in battle in the upper Taughannock Gorge. His body was hurled over the precipice, and thus, the falls was named after him.

A picturesque trail leads through the gorge to the foot of the falls. Another trail winds along the rim of the gorge terminating at the falls overlook where a magnificent view of the falls may be enjoyed. This overlook can also be reached by car.

At the mouth of Taughannock Creek, a large delta was formed with a mile of lake frontage. Here expansive lawns provide recreation fields and picnic areas. The swimming area is located on a natural gravel beach along the south cove.

A small marina and boat launching ramp are located in a sheltered lagoon. This is a popular fishing and boating access site, and smelt fishing in early spring attracts a crowd of enthusiastic smelters of all ages.

The cabin colony and camping area are situated in secluded areas away from day-use areas.

The Administration Headquarters for the Finger Lakes State Park and Recreation Commission is located [illegible] park on an attractive site overlooking Cayuga Lake.

FINGER LAKES STATE PARK AND RECREATION COMMISSION

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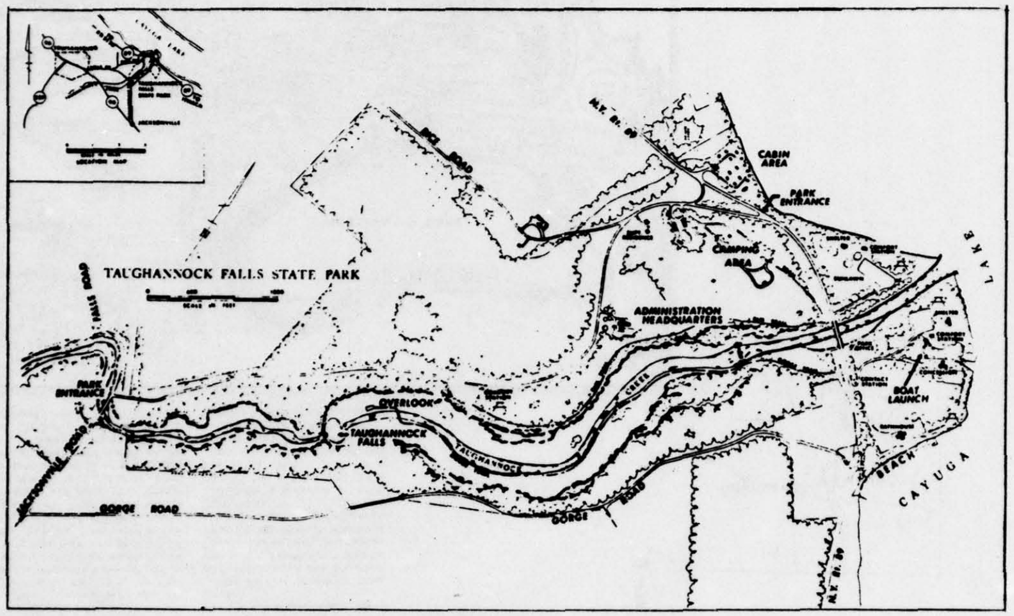
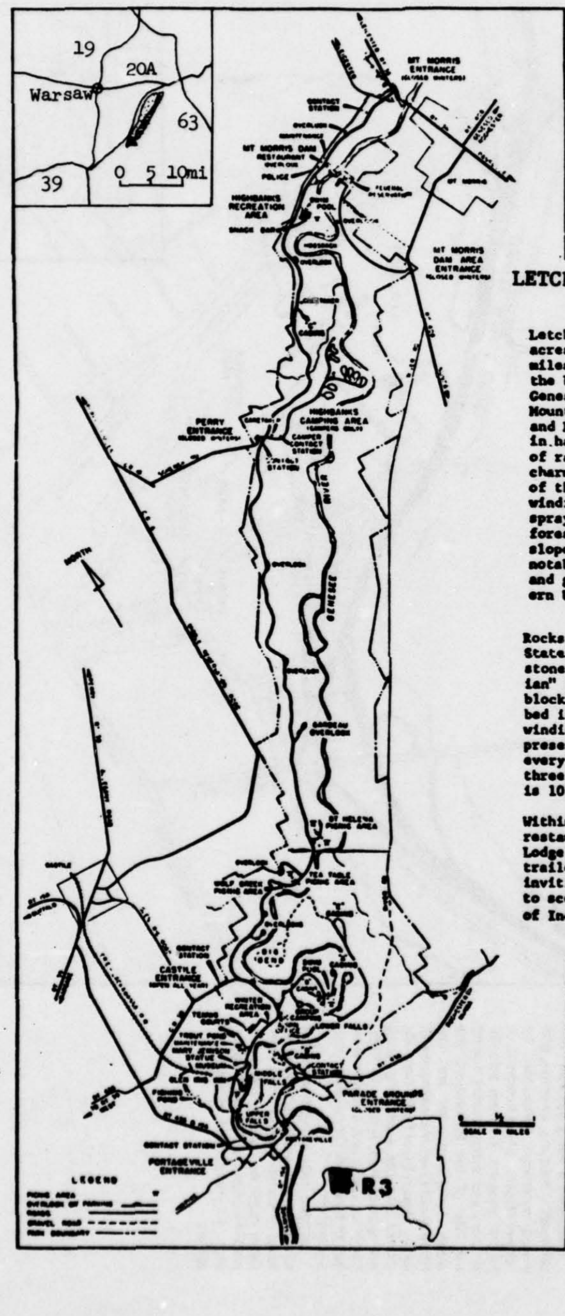




LETCHWORTH STATE PARK

Letchworth State Park, 14,340 acres of scenic beauty, 35 miles south of Rochester, in the beautiful valley of the Genesee, with entrances at Mount Morris, Perry, Castile, and Portageville is distinctive in having a natural landscape of rare quality and unique charm. The precipitous walls of the gorge with the river winding below, the plunge and spray of the falls, and the forest cover of the brink and slopes make it one the most notable examples of waterfall and gorge scenery in the Eastern United States.

Rocks exposed in Letchworth State Park are shales and sandstones formed during the "Devonian" period.A product of glacial blocking of the original river bed is the 17 miles of deep winding canyons and valleys which present an inviting panorama at every turn. The river roars over three major falls, one of which is 107 feet high.

Within its boundaries are good restaurants, Glen Lake Inn and Lodge, camping cabins, tent and trailer campsites, swimming pools, inviting roads and trails leading to scenic beauties, and a museum of Indian and Pioneer History.

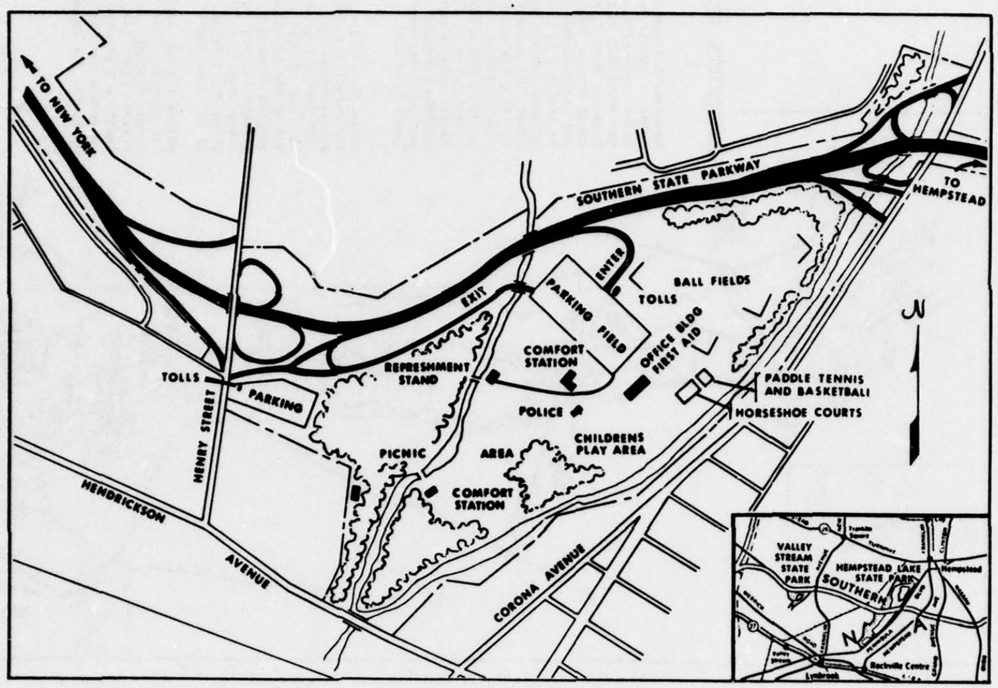
LONG ISLAND STATE PARK AND RECREATION COMMISSION

VALLEY STREAM STATE PARK

Valley Stream, New York 11582
Tel: 516-825-4128

Described in early days as "impenetrable" thickets, swamps, and inland waterways surrounded by heavier thickets where hundreds of British loyalists hid from colonial soldiers and sympathizers during the War of the Revolution, the areas comprising what are now Hempstead Lake, Massapequa and Valley Stream State Parks were absorbed into the expanding Long Island State Park system in 1925. The land, lakes and streams were part of New York City's water supply system.

Wooded trails along fresh water streams and a picnic area are features of Valley Stream State Park. Other facilities include horseshoe pitching courts, playground apparatus, playfields and refreshment stands.



BAYARD CUTTING ARBORETUM

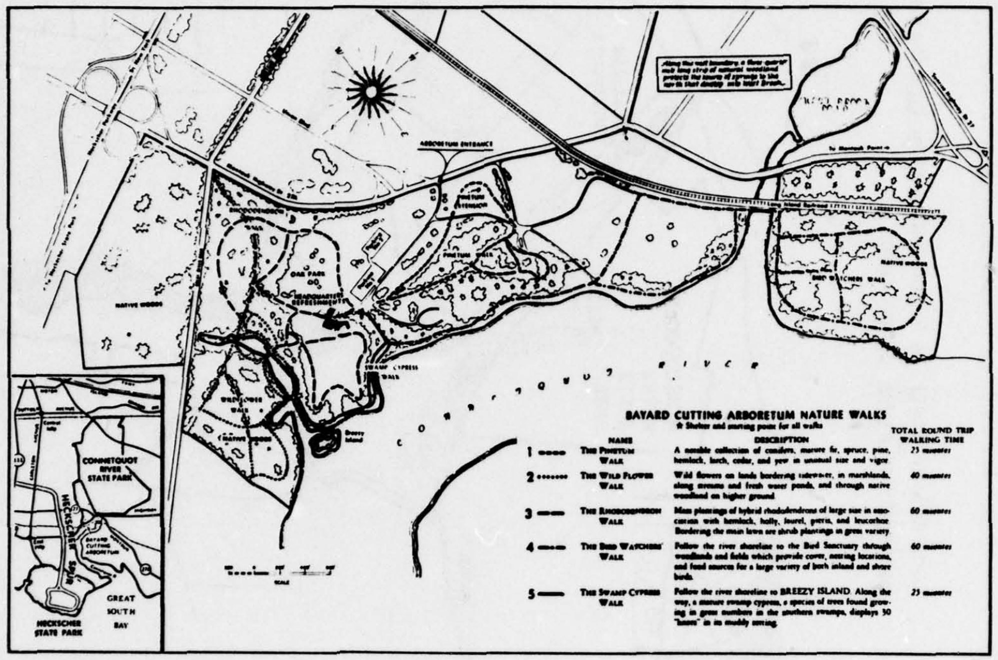
Oakdale, N.Y. 11769
Tel: 516 581-1002

The Bayard Cutting Arboretum was donated to the Long Island State Park and Recreation Commission by Mrs. William Bayard Cutting and her daughter, Mrs. Bayard James, in memory of William Bayard Cutting; for the purpose of providing "an oasis of beauty and quiet for the pleasure, rest and refreshment of those who delight in outdoor beauty; and to bring about a greater appreciation and understanding of the value and importance of informal planting."

The development of the arboretum property, consisting of 690 acres, including a strip to the north protecting the headwaters of the West Brook, was started by Mr. Cutting in 1887, in accordance with plans made by the late Frederick Law Olmsted. Many of the fine specimens in the Pinetum date back to the original plantings of fir, spruce, pine, cypress, cedar, yew and hemlock. The broadleaf evergreens are extensively represented in the growth of rhododendrons and azaleas which border the walks and drives. Wild flowers are featured along the Wild Flower Walks located in a nearly sea level setting of three fresh-water ponds fed by tiny streamlets. Many varieties of aquatic birds may be seen along the Connetquot River.

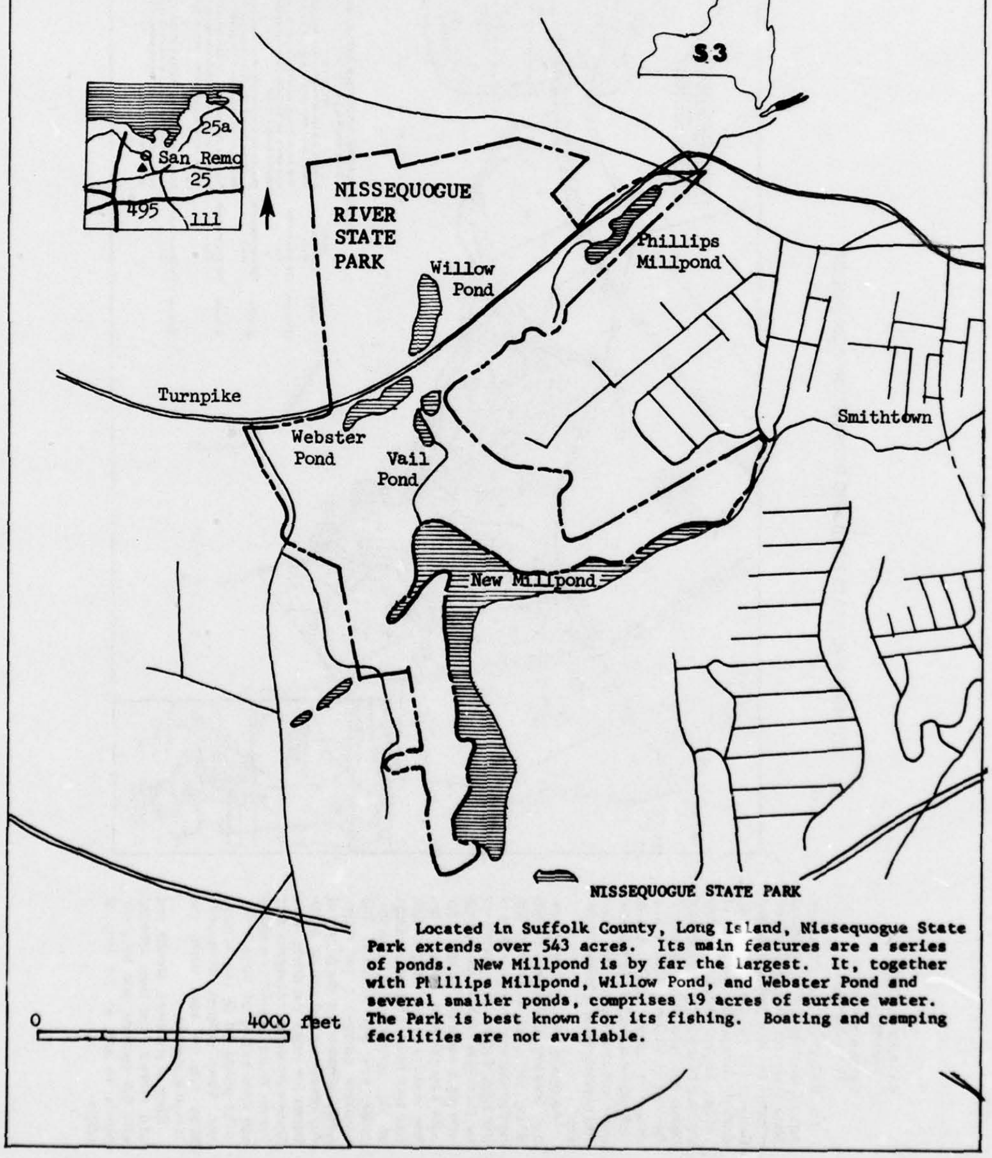
Many of the trees, shrubs and wild flowers have been labelled with the common and botanical names as well as the land of origin.

LONG ISLAND STATE PARK AND RECREATION COMMISSION



Long Island State Park and Recreation Commission

NISSEQUOGUE RIVER STATE PARK

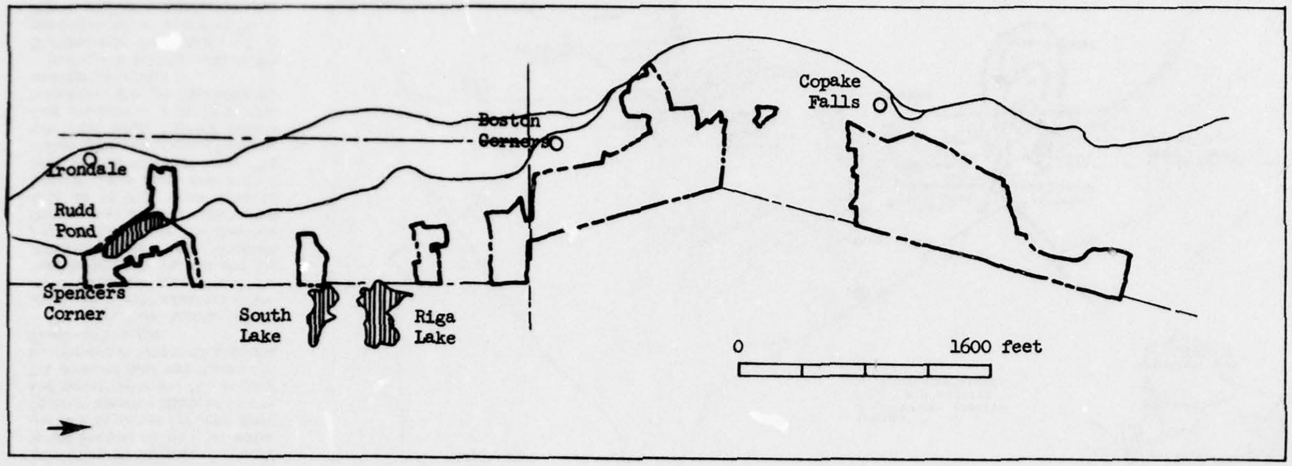


NISSEQUOGUE STATE PARK

Located in Suffolk County, Long Island, Nissequogue State Park extends over 543 acres. Its main features are a series of ponds. New Millpond is by far the largest. It, together with Phillips Millpond, Willow Pond, and Webster Pond and several smaller ponds, comprises 19 acres of surface water. The Park is best known for its fishing. Boating and camping facilities are not available.

Taconic State Park and Recreation Commission

TACONIC STATE PARK



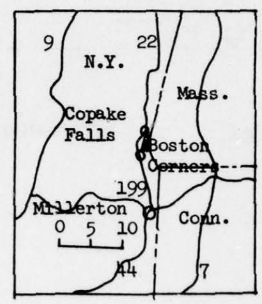
TACONIC STATE PARK

Taconic State Park is located east of Route 22 and extends from Copake Falls in Columbia County, southward 14 miles to the vicinity of Millerton in Dutchess County. It is divided into two main areas; the Rudd Pond area near Millerton and the Copake Falls area.

The Rudd Pond area, located just north of of Millerton in Dutchess County is tucked into the side of the majestic Taconic Range. The area offers the visitor swimming, picnicking, camping, boating, hiking, fishing, and a play area. A central shower building is available in the camping area.

Copake Falls area is truly a hiker's paradise, featuring many trails, some of which lead to one of the great natural wonders of the area--Bash Bish Falls in Massachussetts.

Trout fishing is at its finest in Taconic State Park with Ore Pit and Bash Bish Brook near the Copake Falls area, Weed Mines Pond south of Boston Corners, and Iron Mine Pond near Rudd Pond.



JOHN BOYD THACHER STATE PARK
Voorheesville, N.Y. 12186
Tel: 518-872-1237

John Boyd Thacher State Park is located in Albany County on N.Y.S. Route 157, 18 miles west of Albany and 17 miles south of Schenectady. The park is situated on the Helderberg Escarpment, acknowledged by geologists and paleontologists to be one of the richest fossil bearing formations in the world with some of the most interesting disclosures of ancient times. Encompassing 1,347 acres, the park is named for John Boyd Thacher, a former Mayor of Albany and noted historian. The original 350 acres of land was donated in his memory in 1914 by Mrs. Emma Treadwell Thacher.

The park has several picnic areas, some with excellent views. An unsurpassed panorama of the Hudson-Mohawk Valleys and the Adirondack and Green Mountain peaks is seen from the Overlook Parking Area which is open from 8 A.M. to 10 P.M. from June 16 through Labor Day, and from 8 A.M. to dusk all other times. The Indian Ladder Geological Trail and the John Boyd Thacher Nature Trail are open 8 A.M. to 8 P.M. from May 1 through November 15, weather permitting.

During the summer season the Olympic size swimming pool is one of the park's major attractions. Adjoining it is a game area with tennis, handball and horseshoe courts. Winter activities include ski touring, snowshoeing, tobagganing and snowmobiling. Heated comfort stations are located at Hop Field and Mine Lot Picnic Areas.

SARATOGA-CAPITAL DISTRICT STATE PARK AND RECREATION COMMISSION

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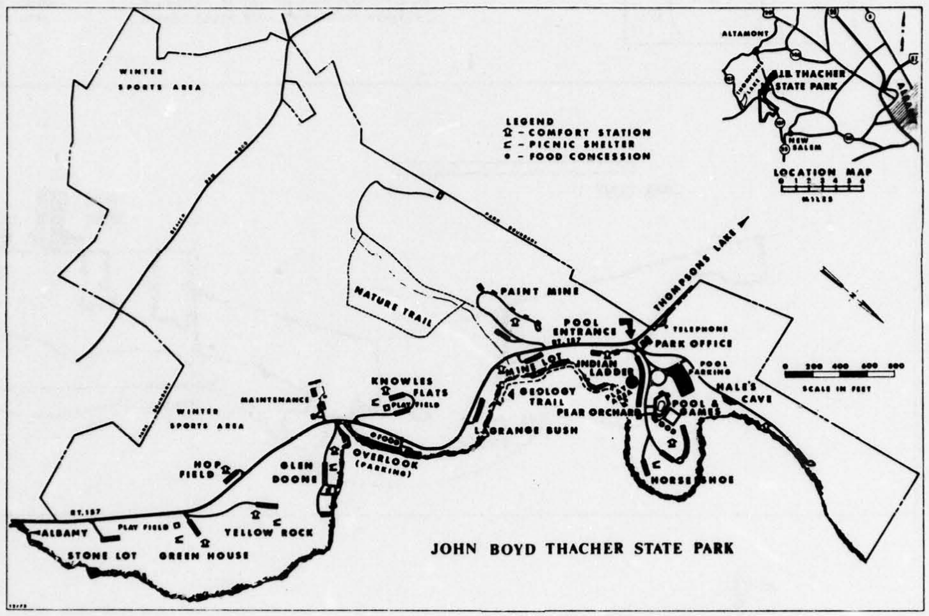


JOHN BOYD THACHER STATE PARK

CENTRAL NEW YORK STATE PARK & RECREATION COMMISSION

BOWMAN LAKE STATE PARK

Oxford, New York 13830
Tel: 607 334-2718

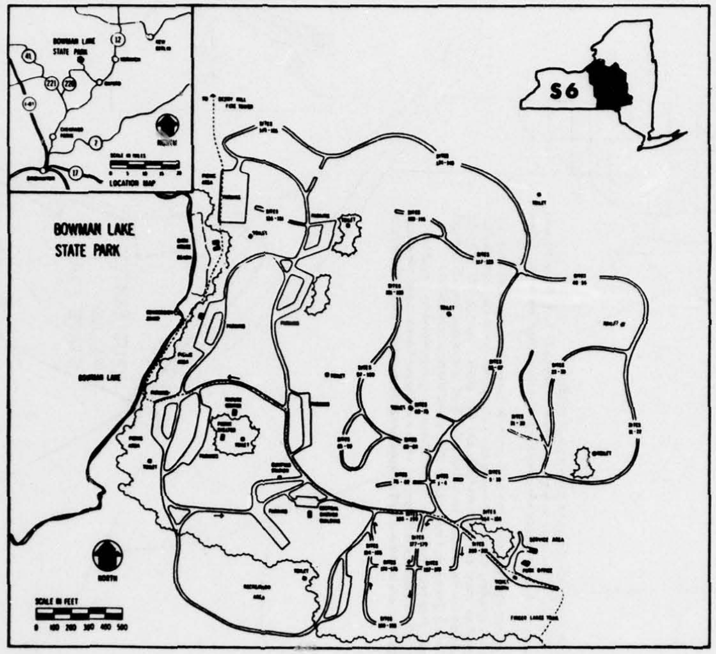
Bowman Lake is described by some as a campers' paradise, a rural, natural setting in a section of New York State steeped in folklore and historic tradition. The woodland atmosphere has been preserved and the 660 acres remain a remote sylvan retreat. Eighteen miles of completed Finger Lakes Trail run through the park and are ideal for hiking. Deer and raccoon are often observed and a variety of woodland birdlife is enjoyed by nature enthusiasts.

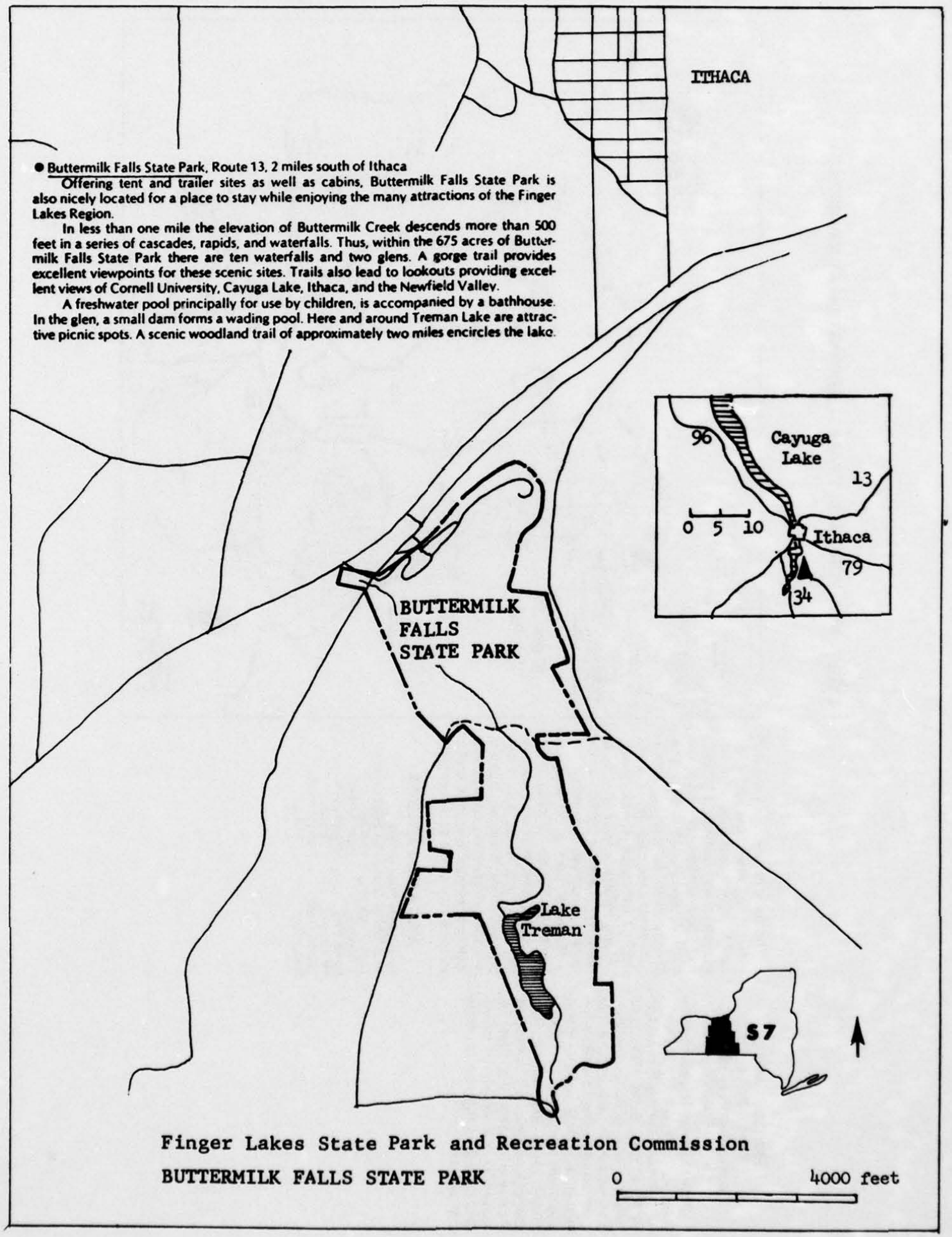
The park is open all year, but summer is the most popular. Scenic park roads weave about evergreen and hardwood forests. The large, shaded campsites are nestled beneath lofty trees. The 35-acre lake features a sandy swimming beach and is regularly stocked with trout. Winter brings snowmobilers who enjoy outstanding winter scenery while driving on designated trails.

Bowman Lake is located in Chenango County, 8 miles west of Oxford, New York with access off N.Y. State Route 220. Chenango County Museum, located in nearby Norwich, captures the feeling of bygone eras with crafts and artifacts of the early settlers.

AVAILABLE FACILITIES

Tent-Trailer Sites — 202
Tent-Trailer Sites, with Elect.—none
Trailer Dumping Station
Swimming
Picnicking
Hiking Trails
Bathhouse
Fishing
Boat Rental
Snowmobile Trails
Refreshment Stand





● Buttermilk Falls State Park, Route 13, 2 miles south of Ithaca

Offering tent and trailer sites as well as cabins, Buttermilk Falls State Park is also nicely located for a place to stay while enjoying the many attractions of the Finger Lakes Region.

In less than one mile the elevation of Buttermilk Creek descends more than 500 feet in a series of cascades, rapids, and waterfalls. Thus, within the 675 acres of Buttermilk Falls State Park there are ten waterfalls and two glens. A gorge trail provides excellent viewpoints for these scenic sites. Trails also lead to lookouts providing excellent views of Cornell University, Cayuga Lake, Ithaca, and the Newfield Valley.

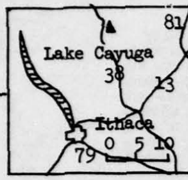
A freshwater pool principally for use by children, is accompanied by a bathhouse. In the glen, a small dam forms a wading pool. Here and around Treman Lake are attractive picnic spots. A scenic woodland trail of approximately two miles encircles the lake.

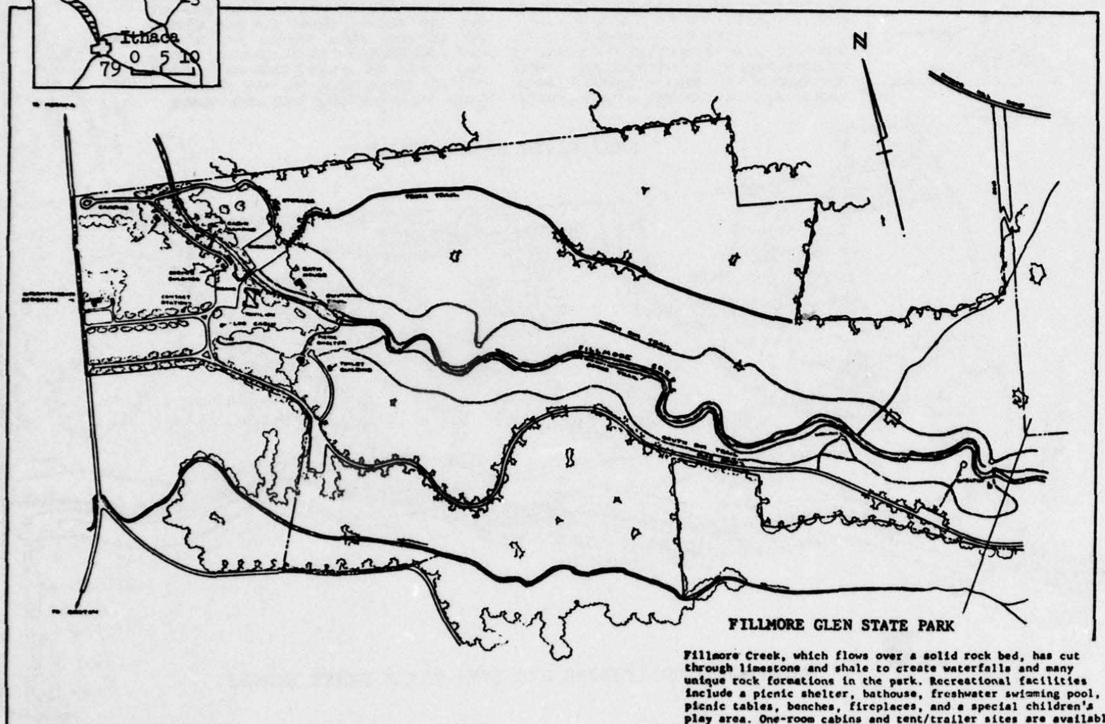
Finger Lakes State Park and Recreation Commission

BUTTERMILK FALLS STATE PARK

Finger Lakes State Park and Recreation Commission

FILLMORE GLEN STATE PARK



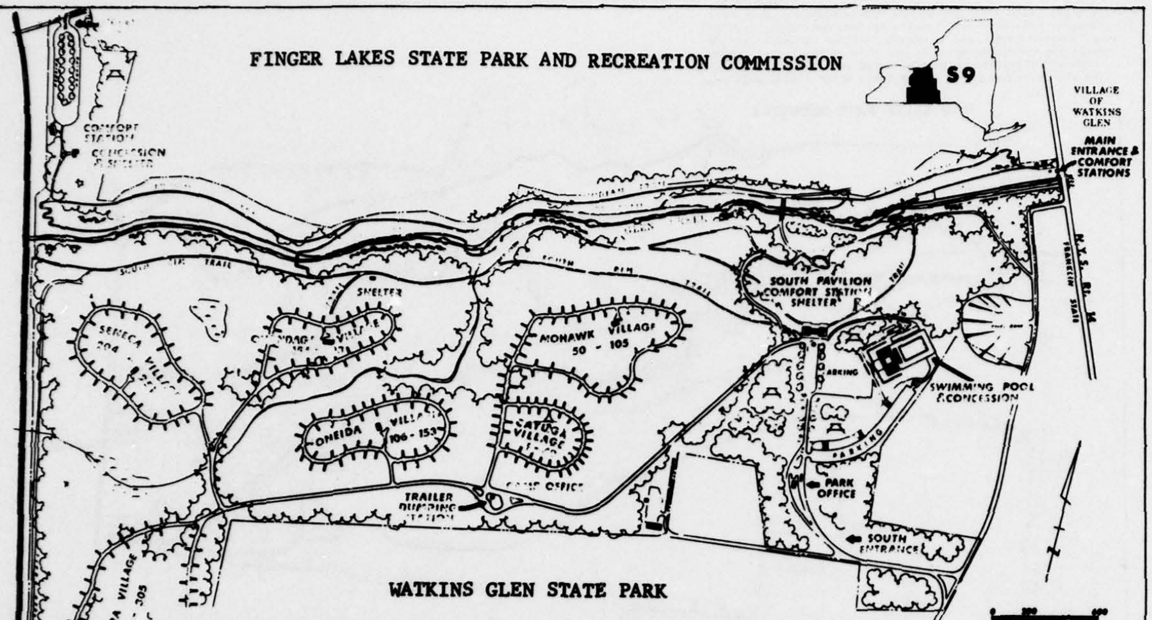


FILLMORE GLEN STATE PARK

Fillmore Creek, which flows over a solid rock bed, has cut through limestone and shale to create waterfalls and many unique rock formations in the park. Recreational facilities include a picnic shelter, bathouse, freshwater swimming pool, picnic tables, benches, fireplaces, and a special children's play area. One-room cabins and tent/trailer sites are available for camping.

The park features the Millard Fillmore Cabin, a replica of the log cabin which was the birth place of Millard Fillmore, 13th president of the United States.

FINGER LAKES STATE PARK AND RECREATION COMMISSION



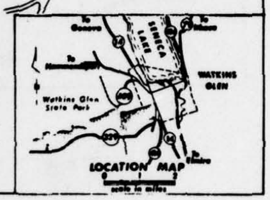
WATKINS GLEN STATE PARK

Watkins Glen State Park, one of the scenic wonders of America, is the oldest and best known of the state parks in the Finger Lakes Region. The main gorge trail takes the visitor through rock tunnels, under waterfalls and through mist and spray. Nineteen waterfalls and interesting rock formations extend for two miles with cliff walls towering 300 feet above the trail. Mosses, ferns and wild flowers cling to the rock crevices.

At the upper end of the trail, rest rooms and a refreshment stand await the visitor. Return trails follow the rim of both sides of the gorge through scenic woodlands back to the main entrance. There is a total of 668 acres in the park, only half of it is shown on the map.

Park facilities at the south entrance include picnicking, a 50 meter outdoor swimming pool and a spacious 305 site camping area.

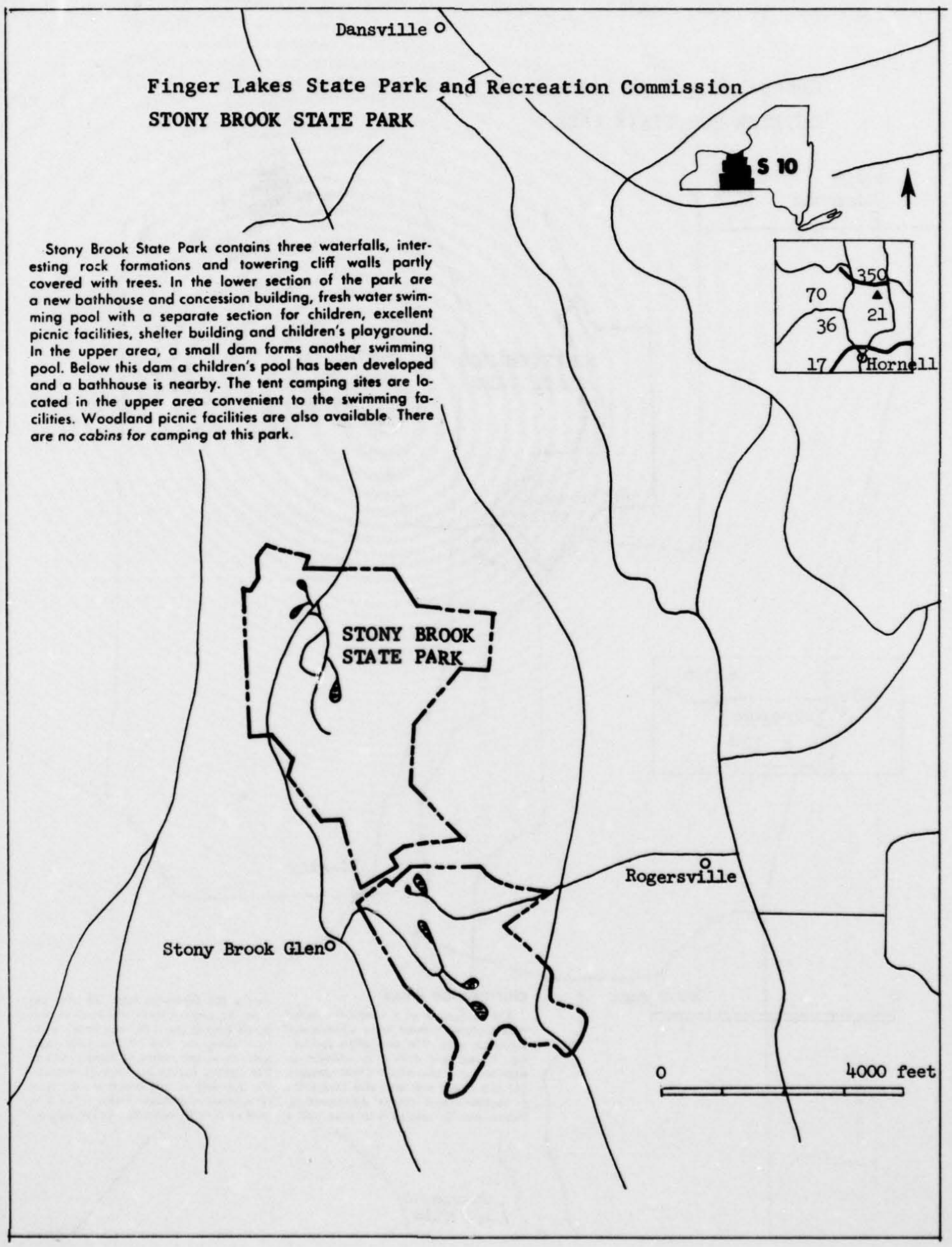
Nearby Seneca Lake is noted for its lake trout fishing and Catherine Creek is famous for its annual spring run of rainbow trout.



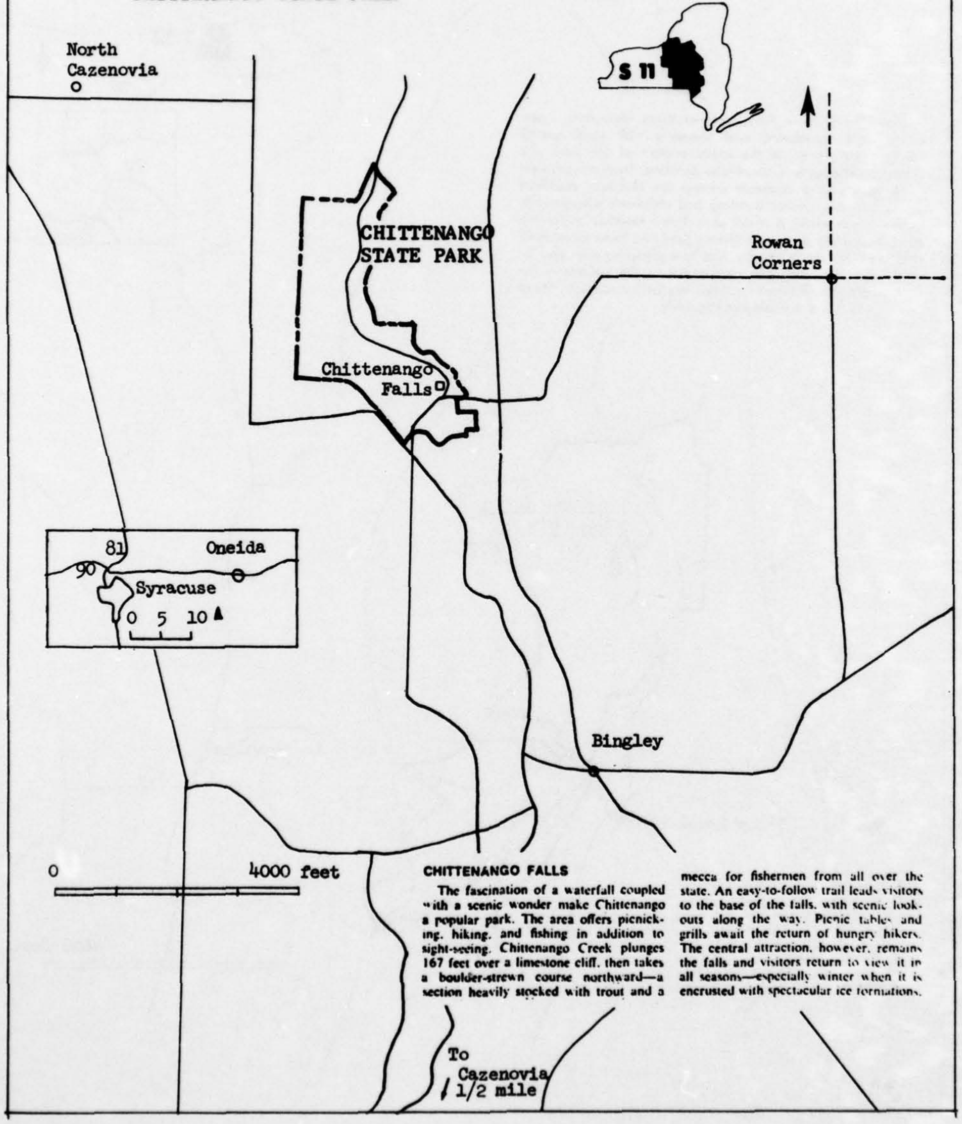
Finger Lakes State Park and Recreation Commission

STONY BROOK STATE PARK

Stony Brook State Park contains three waterfalls, interesting rock formations and towering cliff walls partly covered with trees. In the lower section of the park are a new bathhouse and concession building, fresh water swimming pool with a separate section for children, excellent picnic facilities, shelter building and children's playground. In the upper area, a small dam forms another swimming pool. Below this dam a children's pool has been developed and a bathhouse is nearby. The tent camping sites are located in the upper area convenient to the swimming facilities. Woodland picnic facilities are also available. There are no *cabins for camping* at this park.



Central New York State Park and Recreation Commission
CHITTENANGO STATE PARK

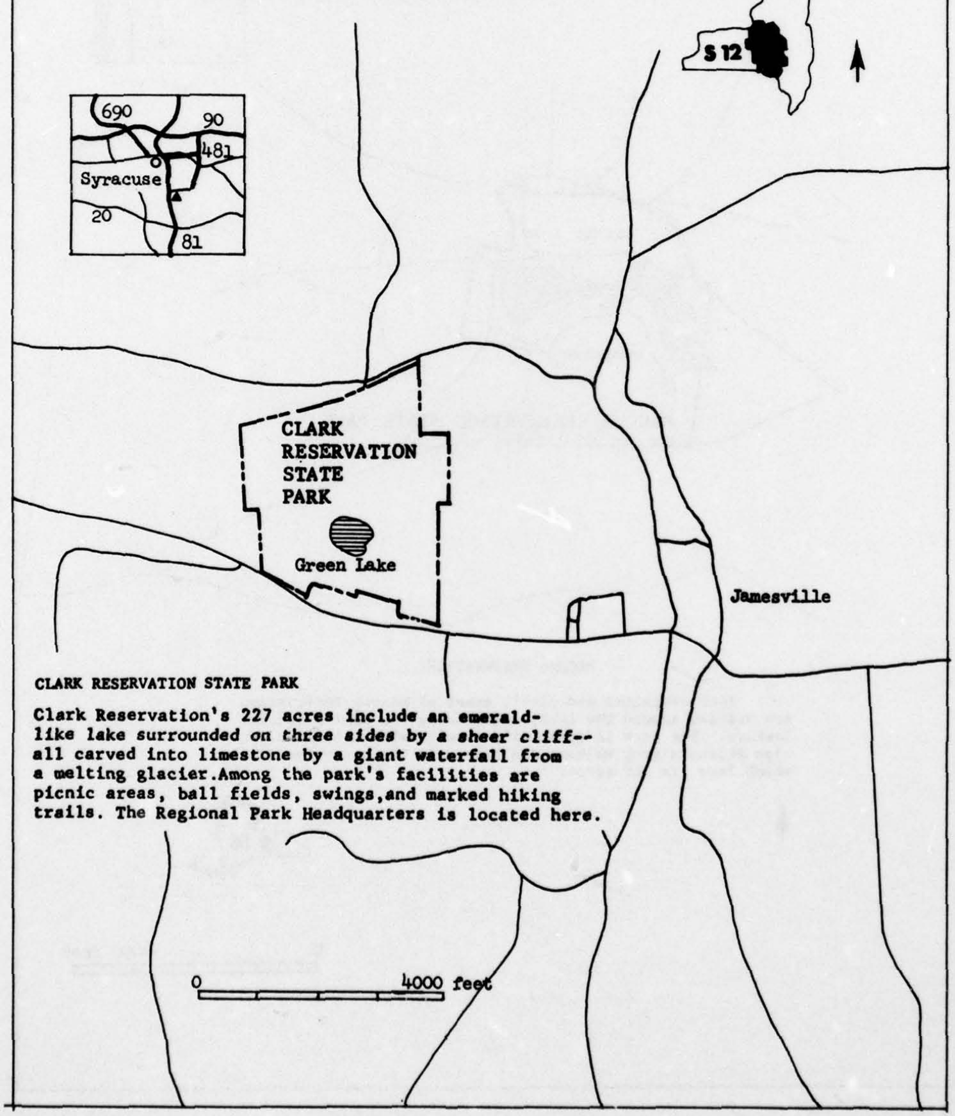


CHITTENANGO FALLS

The fascination of a waterfall coupled with a scenic wonder make Chittenango a popular park. The area offers picnicking, hiking, and fishing in addition to sight-seeing. Chittenango Creek plunges 167 feet over a limestone cliff, then takes a boulder-strewn course northward—a section heavily stocked with trout and a mecca for fishermen from all over the state. An easy-to-follow trail leads visitors to the base of the falls, with scenic lookouts along the way. Picnic tables and grills await the return of hungry hikers. The central attraction, however, remains the falls and visitors return to view it in all seasons—especially winter when it is encrusted with spectacular ice formations.

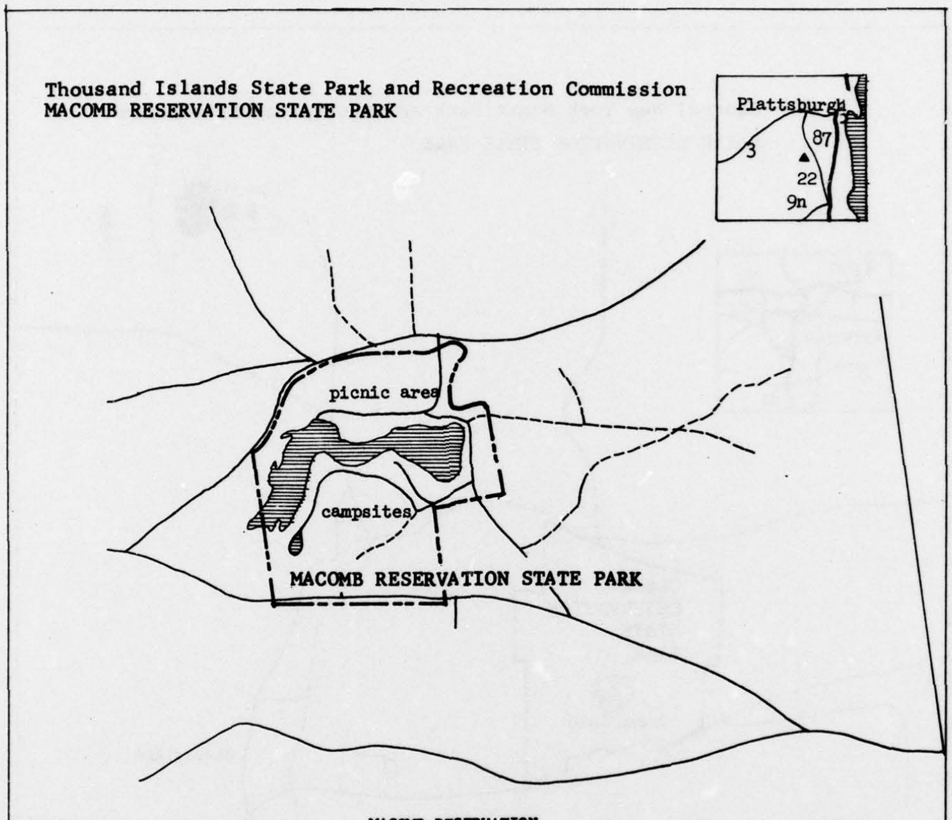
Central New York State Park and Recreation Commission

CLARK RESERVATION STATE PARK



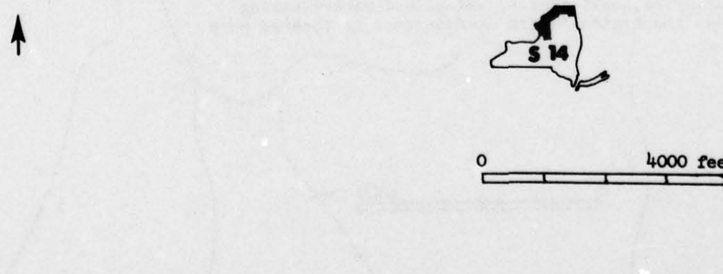
CLARK RESERVATION STATE PARK

Clark Reservation's 227 acres include an emerald-like lake surrounded on three sides by a sheer cliff--all carved into limestone by a giant waterfall from a melting glacier. Among the park's facilities are picnic areas, ball fields, swings, and marked hiking trails. The Regional Park Headquarters is located here.



MACOMB RESERVATION

Both campsites and picnic areas of Macomb Reservation are nestled around the lake, which forms the park's central feature. The park is especially popular with fishermen, but also attracts many walkers and hikers to the extensive trails which lace its 510 acres.



APPENDIX C: TYPE OF ACTIVITY PREFERRED AT EACH PARK

Table C

Actitivites Preferred at 30 Selected New York Parks

LETCHWORTH STATE PARK (49 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	39	15	1	0	5	15	2	1	4	2	0	10
IMPORTANT	23	6	1	0	5	2	1	0	4	6	0	3
PRINCIPAL	19	2	2	0	5	3	1	0	11	3	1	2

BUTTERMILK FALLS STATE PARK (15 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	3	13	0	0	1	9	0	0	5	1	1	1
IMPORTANT	0	11	0	0	0	1	0	0	2	0	0	1
PRINCIPAL	2	7	0	0	1	2	0	0	2	0	0	1

CAYUGA LAKE STATE PARK (47 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	34	39	2	0	5	5	10	0	10	0	0	0
IMPORTANT	19	20	0	0	2	1	0	0	3	0	0	0
PRINCIPAL	18	12	0	0	9	0	0	0	5	0	0	1

FAIRHAVEN BEACH STATE PARK (55 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	39	45	14	7	4	7	5	2	14	2	0	0
IMPORTANT	14	30	7	2	1	1	0	0	10	1	0	0
PRINCIPAL	10	13	7	1	6	0	0	0	12	1	0	5

FILLMORE GLEN STATE PARK (21 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	6	12	0	0	8	6	4	0	5	2	0	1
IMPORTANT	1	5	0	0	5	1	2	0	3	1	0	2
PRINCIPAL	5	4	0	0	2	1	0	0	5	0	0	4

(continued)

Table C

SAMPSON STATE PARK (59 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	27	33	20	7	15	16	1	6	16	2	0	1
IMPORTANT	12	14	12	6	12	6	0	2	16	1	0	1
PRINCIPAL	15	8	9	4	3	4	0	0	10	1	0	2

STONY BROOK STATE PARK (71 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	54	58	1	0	11	53	16	1	11	0	0	0
IMPORTANT	13	24	0	0	7	11	0	0	15	5	0	3
PRINCIPAL	22	13	0	0	9	0	1	0	18	0	1	7

TAUGHANNOCK FALLS STATE PARK (38 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	22	20	6	5	2	15	3	0	4	3	0	0
IMPORTANT	7	9	4	5	1	6	0	0	6	5	0	0
PRINCIPAL	7	4	4	2	1	4	0	0	10	2	0	2

WATKINS GLEN STATE PARK (23 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	17	10	0	0	0	14	0	0	1	13	1	2
IMPORTANT	1	5	0	0	2	3	0	0	1	10	1	1
PRINCIPAL	1	4	0	0	4	0	0	0	4	8	1	1

BATTLE ISLAND STATE PARK (101 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	0	1	0	1	1	1	2	1	0	0	0	0
IMPORTANT	0	0	0	0	1	0	0	0	0	0	0	0
PRINCIPAL	0	0	0	0	7	0	90	0	1	0	0	2

(continued)

Table C

BOWMAN LAKE STATE PARK (44 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	33	35	8	2	9	6	1	0	7	0	0	0
IMPORTANT	14	15	4	0	6	0	0	0	5	1	0	0
PRINCIPAL	17	9	3	0	4	1	0	0	5	0	0	5

CHENANGO VALLEY STATE PARK (212 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	130	128	14	18	34	63	67	11	52	1	0	2
IMPORTANT	76	49	6	0	19	7	34	3	26	1	0	0
PRINCIPAL	95	23	3	0	22	4	32	4	22	0	1	3

CHITTENANGO FALLS STATE PARK (117 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	106	4	0	0	12	59	23	7	20	34	0	7
IMPORTANT	87	0	0	0	1	7	6	0	19	15	0	5
PRINCIPAL	79	0	0	0	5	2	5	0	11	8	0	7

CLARK RESERVATION STATE PARK (58 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	58	3	2	0	3	31	24	0	14	1	0	2
IMPORTANT	54	0	0	0	1	2	1	0	3	0	0	0
PRINCIPAL	48	0	0	0	5	2	1	0	2	0	0	0

GLIMMERGLASS STATE PARK (74 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	51	54	6	8	5	2	6	0	14	0	1	1
IMPORTANT	13	44	1	6	3	1	1	0	13	1	0	6
PRINCIPAL	8	10	0	1	11	0	0	0	16	0	2	25

(continued)

Table C

CLARENCE FAHNSTOCK STATE PARK (54 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	29	0	35	10	6	16	0	0	10	2	0	0
IMPORTANT	18	0	16	3	2	10	0	0	10	0	0	0
PRINCIPAL	17	0	16	4	2	5	0	0	9	0	0	0

MOHANSIC STATE PARK (108 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	83	82	4	35	0	4	25	2	15	1	0	0
IMPORTANT	42	38	2	5	2	1	4	0	17	0	0	0
PRINCIPAL	31	27	2	3	8	1	2	0	30	0	0	1

TACONIC STATE PARK (41 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	13	37	10	5	8	9	4	0	7	2	0	0
IMPORTANT	4	26	3	1	4	3	0	0	2	2	0	1
PRINCIPAL	2	15	1	1	7	2	0	0	8	2	0	3

BEAR MOUNTAIN STATE PARK (91 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	43	27	7	24	5	35	26	1	14	4	23	1
IMPORTANT	16	11	4	4	6	15	8	0	22	2	1	2
PRINCIPAL	13	6	2	0	13	5	1	0	32	2	1	9

ROCKLAND LAKE STATE PARK (204 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	124	135	14	39	20	24	56	31	37	12	1	5
IMPORTANT	41	65	4	3	13	4	5	14	51	9	0	4
PRINCIPAL	20	33	3	0	46	5	1	11	69	3	0	11

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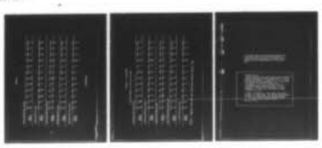

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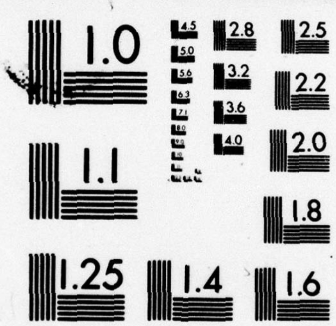

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Table C

BELMONT LAKE STATE PARK (175 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	130	1	16	75	13	36	75	20	41	18	0	9
IMPORTANT	75	0	9	12	16	16	11	9	35	4	0	9
PRINCIPAL	29	1	7	4	37	10	3	7	40	1	0	27

CAPTREE STATE PARK (193 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	31	22	131	26	3	22	2	1	43	43	15	12
IMPORTANT	8	6	103	10	3	6	0	0	44	21	8	4
PRINCIPAL	9	2	87	10	7	1	1	0	44	16	11	5

BAYARD CUTTING STATE PARK (133 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	0	0	0	0	0	104	0	0	29	91	0	6
IMPORTANT	0	0	0	0	0	37	0	0	42	53	0	18
PRINCIPAL	2	0	1	0	1	10	1	0	65	13	0	38

HECKSHER STATE PARK (84 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	53	56	3	2	4	6	22	5	26	1	1	2
IMPORTANT	26	27	2	2	2	1	4	1	18	1	0	1
PRINCIPAL	17	18	2	1	8	0	1	2	26	1	0	6

JONES BEACH STATE PARK (113 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	24	92	0	0	24	22	31	0	58	7	0	5
IMPORTANT	0	53	0	0	5	8	1	0	40	8	0	6
PRINCIPAL	0	20	0	0	13	1	2	1	68	0	0	8

(continued)

Table C - concluded

ACTIVITIES PREFERRED AT 30 SELECTED NEW YORK PARKS

SUNKEN MEADOW STATE PARK (183 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	81	128	15	0	11	29	40	5	75	9	0	6
IMPORTANT	45	66	10	0	8	15	23	1	44	5	0	2
PRINCIPAL	30	33	6	0	20	10	13	1	60	3	1	6

VALLEY STREAM STATE PARK (119 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	95	0	0	0	7	24	48	7	55	0	0	3
IMPORTANT	62	0	0	0	6	9	19	7	29	0	0	5
PRINCIPAL	44	0	0	0	22	2	3	2	32	5	1	6

NISSEQUOQUE STATE PARK (39 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	0	0	25	0	0	9	0	0	3	10	0	1
IMPORTANT	0	0	18	0	0	2	0	0	5	7	0	3
PRINCIPAL	0	0	23	0	0	2	0	0	3	7	0	3

MACOMB RESERVATION STATE PARK (22 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	17	8	1	0	10	3	9	1	9	0	0	0
IMPORTANT	9	1	0	0	6	0	1	0	5	0	0	0
PRINCIPAL	10	2	0	0	5	0	1	0	4	0	0	0

J. B. THACHER STATE PARK (113 OBS)

	PICNIC	SWIM	FISH	BOAT	CAMP	HIKE	SPORTS	BIKE	RELAX	NATURE	SPEC ATT	OTHER
TYPICAL	78	57	0	0	10	52	25	1	26	8	0	1
IMPORTANT	44	27	0	0	9	16	3	1	16	2	0	1
PRINCIPAL	31	8	0	0	33	4	0	1	25	4	0	2

Source: Computed from New York State Park Visitor Survey, 1976.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Coughlin, Robert E

Modeling recreation use in water-related parks / by Robert E. Coughlin, David Berry, Pat Cohen, Regional Science Research Institute, Philadelphia, Pa. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1978.

55, [39] p. : ill. ; 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; R-78-1)

Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C., under Contract No. DACW39-77-C-0085.

References: p. 54-55.

1. Parks. 2. Recreation. I. Berry, David, joint author. II. Cohen, Pat, joint author. III. Regional Science Research Institute. IV. United States. Army. Corps of Engineers. V. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; R-78-1.

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